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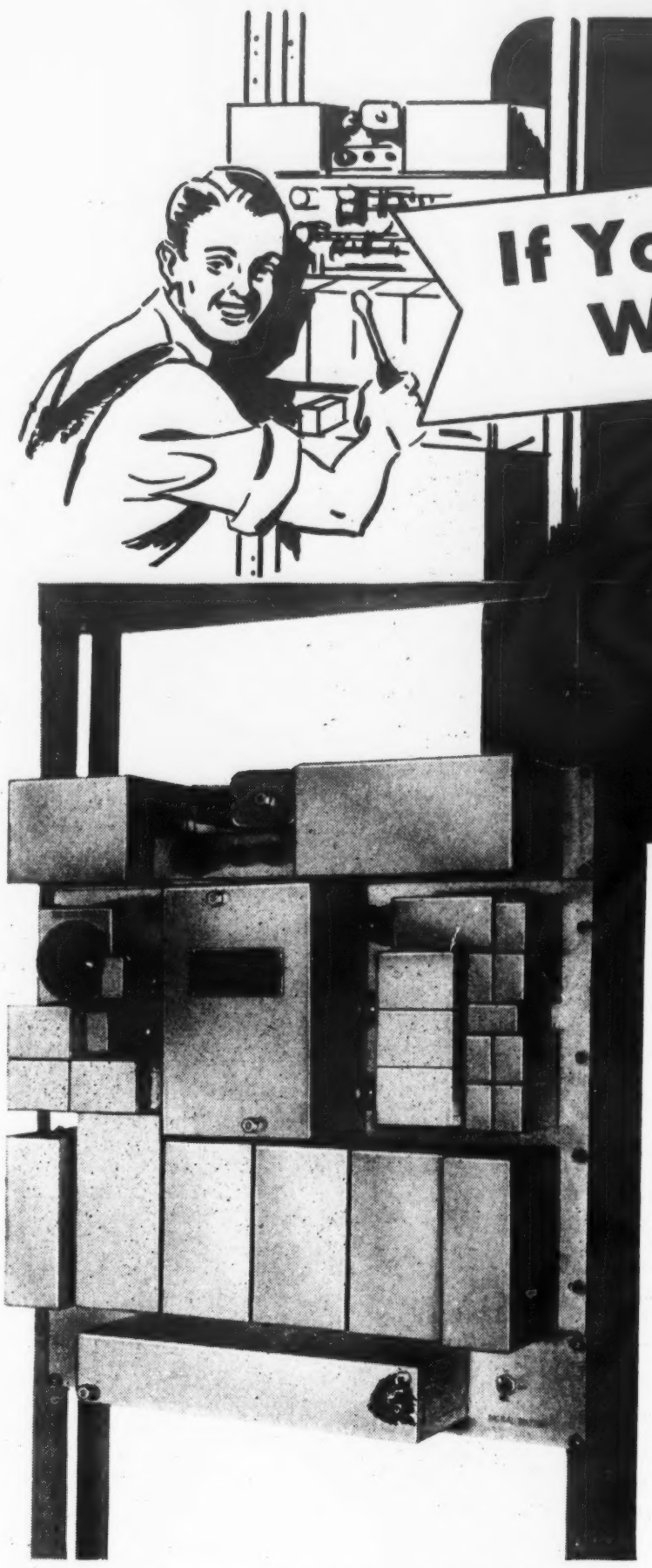

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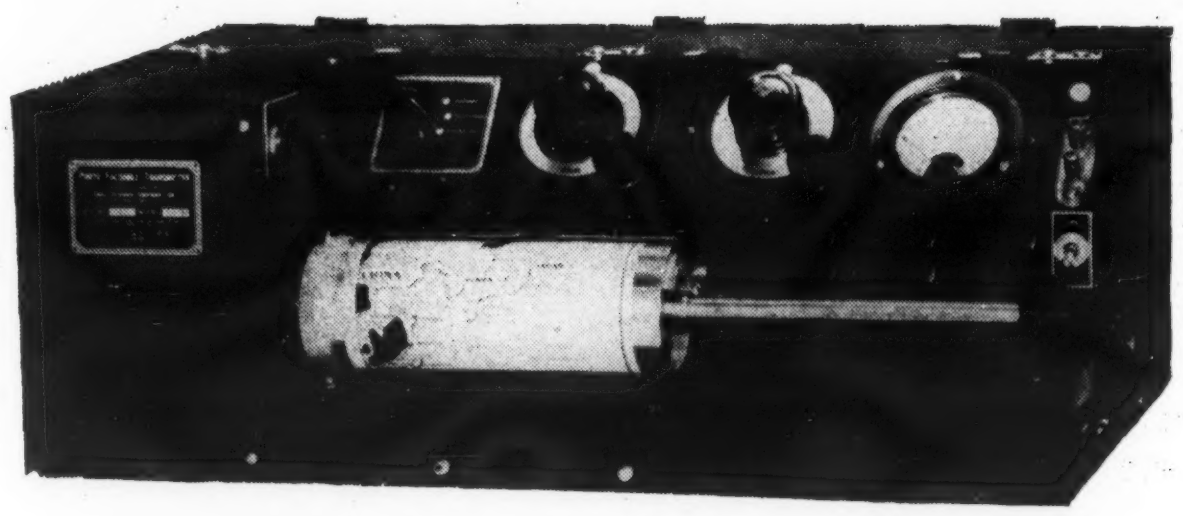

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MILITARY
SIGNALS
LAND ★ SEA ★ AIR

Journal of the Armed Forces Communications Association — Dedicated to Military Preparedness

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Now that SIGNALS is the journal equally of all the communications Services the cover colors will alternate with successive issues between the different Services. The cover colors used approximate the official Service colors as closely as standard printing inks will allow.

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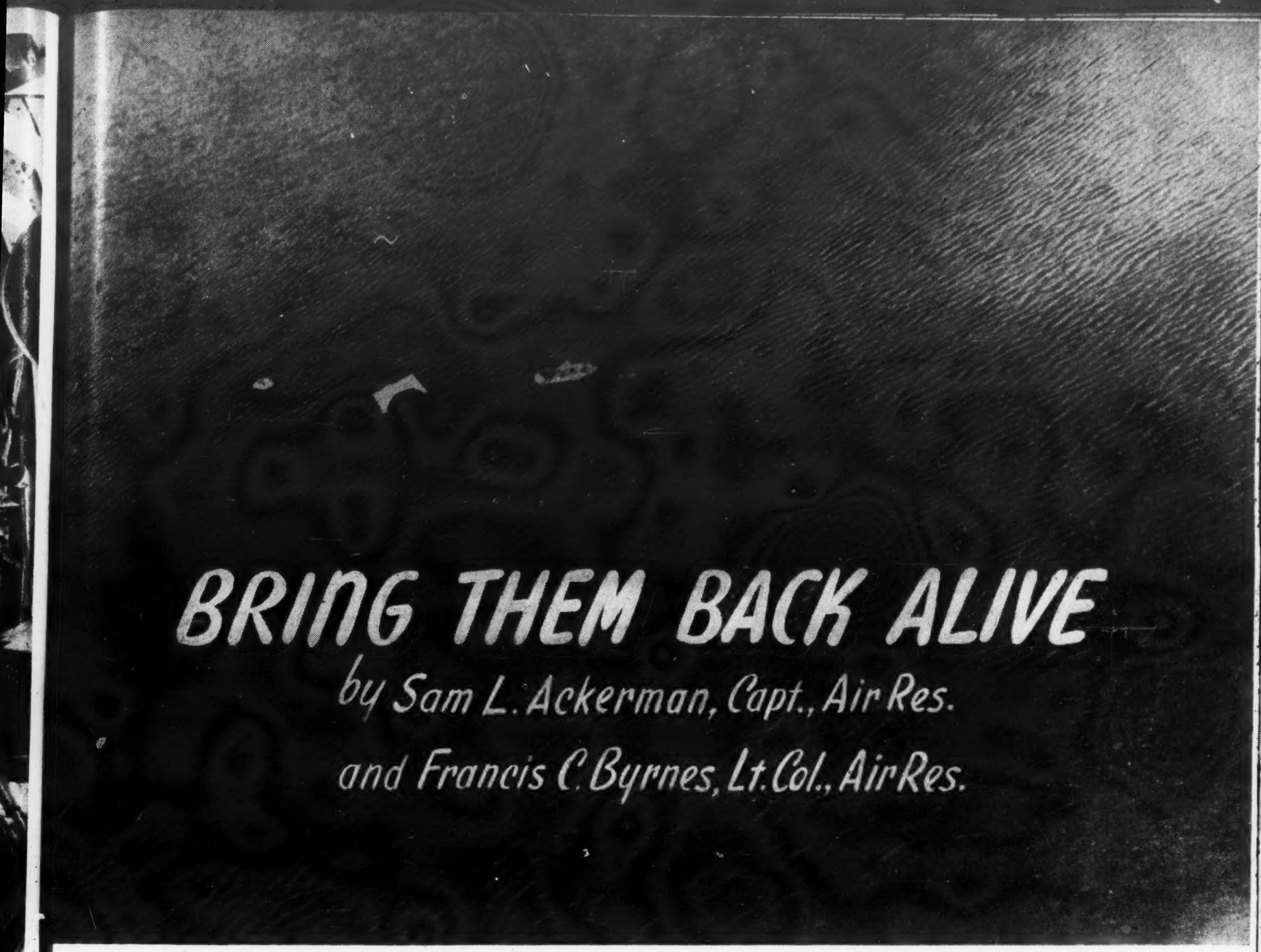
THE COVER

As Chairman of the Munitions Board, Thomas J. Hargrave is looked to by industry to simplify and bring uniformity into procurement for the armed services.

Portrait by Karsh.

Equipped with a parachute and capable of automatic operation, this electronic buoy (AN/CRN-1) can be used by searching aircraft to mark the location of a life raft. Surface craft or amphibian aircraft can then "home" on its signal.



BRING THEM BACK ALIVE

by Sam L. Ackerman, Capt., Air Res.

and Francis C. Byrnes, Lt. Col., Air Res.

BULLETIN

FRANKFURT—(Nov 30)—U. S. Air Force officers here today reported a C-47 transport, with 20 persons aboard, was overdue on a routine flight from Pisa, Italy, to Frankfurt, Germany.

BULLETIN

FRANKFURT—(Dec 7)—More than 100 planes continued in vain today a search of central European areas for the C-47 which vanished enroute here from Pisa, Italy, with 20 persons aboard.

BULLETIN

FRANKFURT—(Dec 12)—Full-scale search for the U. S. Air Force C-47 transport which disappeared 13 days ago on a flight from Pisa, Italy, to Frankfurt was abandoned tonight without solving the mystery of its whereabouts or the fate of the 20 persons aboard.

Too often in aviation's history has its performance record been marred by grim entries such as these terse bulletins that brought gloom and sadness to at least 20 homes this past Christmas season.

More frequently, the record has been smudged and blemished by the many cases, when, after days and weeks of search, an aircraft has been located only to find that all personnel aboard had perished as a result of injuries, from starvation, or through exposure to the elements.

In flying more millions of air miles than any other aviation organization in the World, the United States Air Force has suffered its proportionate share of such experiences. Files of the United States Navy would reveal other tragic stories, such as the mysterious disappearance of five naval aircraft shortly after leaving a Florida base. Or the record can be further documented in the case files of the commercial airlines and the Civil Aeronautics Administration relating to the exhaustive and lengthy searches for commercial airliners forced down or crashed in remote and rugged reaches of the Rocky Mountains.

Even private aircraft, on short flights in populated areas, can and have contributed to the score as was exemplified in a crash in Ohio during the summer of 1947. Two days of fruitless searching by dozens of volunteer aircraft ended when the sole surviving passenger, after lying seriously injured for 36 hours in the wreckage of a light plane, extricated himself and crawled a mile and a half to the nearest farmhouse.

Famed Aviatrix Amelia Earhart disappeared in the vast expanse of the Pacific never to be heard from again. Globe-girdler Wiley Post and Humorist Will Rogers crashed in the desolate Alaskan country and were found dead by an Eskimo, and, fortunately less tragic, Captain Eddie Rickenbacker and his party were finally rescued after drifting for 23 days in a rubber raft in the Pacific Ocean north of Samoa.

Airborne life boat dropped by parachute.

These are the stories that have made headlines, have spurred research and development toward improving safety of flight. In fact, ever since man took to the air, there has been great concern for his safety. Between Kittyhawk and Pearl Harbor, great effort was expended in designing and building aircraft, each to fly higher, faster, and with more reliability than its predecessor. Concurrently, navigation systems were being developed and placed into operation as aids to piloting an aircraft from one point to another. As aircraft and related equipment became more complex, increased emphasis was placed on pilot and crew training.

World War II tremendously accelerated the military services' aeronautical program and provided a means of proving, on a mass scale, the necessity, reliability and applicability of all equipment relating to safety of flight and survival of flying personnel. Given improved aircraft and new navigational systems, more adequately trained pilots were able to fly with potentially less chance of emergencies arising. But emergency situations were still destined to occur, whether from the expected enemy action or through equipment failures, pilot errors, and weather complications.

Fliers forced down while on overwater flights—the Atlantic, the Pacific, and the English Channel—were furnished with a multitude of commodities, conveniently packed, to aid in preserving and sustaining life until rescued: Life rafts and preservers, food, water, first aid supplies, fishing tackle, and numerous other articles. Similar kits were furnished air crews scheduled for operations over land, except machetes and weapons were substituted for the life raft. Especially prepared booklets, containing instructions on how to live off the particular country in which lost, usually were included.

Survival and sustenance kits were not, however, the complete solution. At best, they were sufficient to preserve life and morale for a maximum of only a few hours or days, during which time it was hoped rescue could be made. Means of effecting this rescue surely and promptly became the paramount objective, with electronic communications offering the only feasible and practical approach. First answer lay in adequate and timely reporting, over existing communications facilities whenever possible, of distress calls and position identification, plus full employment of ground direction-finding nets to establish position of lost aircraft and to vector airborne or surface craft to the rescue.

This did not, however, aid aircraft when communications had been rendered inoperative by enemy action, or in the event distress calls were not heard before the crash. Here was the basic problem, and it was attacked by all our services—Army, Navy, Air Force, and Coast Guard—as well as those of our military allies, and of our enemies. All techniques and procedures developed through years of maritime rescue operations were exploited with varying degrees of success.

Gibson Girl Development

Most successful and widely used electronic rescue aid employed by the Allies during World War II, was the medium-frequency hand-cranked transmitter known as the Gibson Girl. Ironically, development of this radio began with the recovery by the British, in early 1941, of a German Notesender NS-2 found floating in the English Channel. Specifications for a similar device were written and a contract negotiated with an American manufacturer for its development and production.

Shortly after, the Signal Corps recognized its possibilities and in late 1941 the Aircraft Radio Laboratory at Wright Field took over the project for both the British and the United States Air Force. First produced in 1942, this equipment, designated SCR-578, represented considerable improvement over the German model. More than 15,000 units were produced for Allied use, and operational reports from all the combat zones are replete with references to its successful employment in aiding rescue of fliers down at sea. The SCR-578 operated on a single distress frequency of 500 kilocycles, and selection could be made for automatic keying of SOS or Morse Code "A," or for manual keying. Antenna was carried aloft by a balloon or kite.

Radar beacons, corner reflectors (effective "mirrors" of radar signals) and marker buoys were among the other electronic rescue aids developed during the war for the Air Force. These were employed to a limited extent, and further engineering effort currently is being expended toward improving the performance of each. Cessation of hostilities marked only a continuation of the Air Force's research and development efforts on emergency rescue, and in this initial postwar period the objectives have been re-evaluated and a positive program launched for its accomplishment.

Standardization of distress frequency channels for emergency use is an integral factor in the present research and development program because it is a prime requisite for the success of any radio rescue system. Calls for aid are useless if potential listeners are standing by on another frequency

or frequencies. Further, because the different frequency bands in the radio spectrum have different sets of propagation characteristics, several common rescue frequencies spot-located in different bands are required to fulfill satisfactorily all of the requirements placed on the system.

This standardization on an international basis is the ultimate goal. It has been accomplished to a limited extent to date in the use of 500 kilocycles, universally recognized as a distress channel. For long range, high frequency direction finding, the United States and several other countries have agreed on 8280 kilocycles as an interim frequency. This will be replaced later by 8364 kilocycles in accordance with the frequency allocation table of the International Telecommunications Union.

Frequencies currently allocated for emergency use in this country are as follows: 500 kilocycles, 2070 kilocycles, 4140 kilocycles, 8280 kilocycles, 140.58 megacycles (until 1 September 1950, 121.50 megacycles thereafter), and 243 megacycles (military use only after 1952).

It is considered essential that a harmonic relationship exist between the high, very high, and ultra high distress frequencies. This permits the dual or triple functioning of crystals and circuits in portable sets operating on one or more of these channels and results in appreciable savings in size and weight. Not all of the distress frequencies presently allocated satisfy this requirement. Replacement of some of these VHF and UHF assignments by frequency spots in harmonic relationship has been recommended.

In reviewing the overall requirements for a system of electronic emergency aids, radio engineers of the Air Materiel Command at Wright Field have concluded that a system of electronic emergency aids "must provide notification that an emergency exists, furnish information as to the exact location of the accident, provide short range communication between distressed personnel and their rescuers, and provide means of marking the location of survivors at sea after they have been spotted from the air—to assure that they will not be lost again before a pick-up can be effected."

Predicated on these objectives, a development program has been charted and is actively underway in the Electronic Subdivision of the AMC's Engineering Division at Wright Field to fulfill at least the Air Force's particular requirements for electronics rescue aids and probably many of those of other aeronautical activities as well. In describing the Air Force's current program and the new equipment emerging therefrom, consideration will be given first to aircraft emergency equipment, which operates before impact, and then to portable, or so-called personal, devices operated by the survivors.

Basic, too, in considering emergency aids for aircraft that must and will fly to the most remote parts of the globe are the wide and varying range of problems relating to rescue over land. Here aviation interests, and particularly the Air Force, must be equipped and ready to remove stranded fliers from snow-swept Arctic icecaps, dense tropical jungle, and impassable mountainous terrain. These requirements are real, not theoretical, and the Air Force already has accomplished some miraculous rescues, once the distressed air crews had been located. Helicopters, ski- or pontoon-equipped aircraft, and airborne lifeboats, dropped by parachute, have been employed by the Air Force. Dropping of food and medical supplies has been accomplished, and now actual tests are underway to determine the feasibility of parachuting rescuers, complete with sleds and dogs, to fliers grounded in Arctic regions.

Sam L. Ackerman

Graduating from OCS at Fort Monmouth, N. J., in 1942, Sam L. Ackerman was a GCI instructor at the AAF School of Applied Tactics, Orlando, Fla., and later was assigned to Radiation Laboratory, MIT, where he assisted in writing and editing the U. S. Radar Survey. At the completion of that project, he was transferred to Wright Field, where he served as an officer, and more recently as a civilian, as chief of the Engineering Data Unit, Technical Information Branch, Electronic Subdivision of the Air Material Command's Engineering Division.

Francis C. Byrnes

Since separation from the service in May 1946, after 4½ years' military duty with the Signal Corps and AF, Francis C. Byrnes has served as chief of the Technical Information Branch, Electronic Subdivision of the Air Material Command's Engineering Division at Wright Field. Called to active duty from an information specialist position with the U. S. Department of Agriculture, Mr. Byrnes was assigned to the Office of the Chief Signal Officer, Washington, D. C.; later he was transferred to the Signal Corps Aircraft Signal Service at Wright Field.

"Gibson Girl" transmitter developed from German set found floating in English Channel early in the war.

During the war, many aircraft encountering emergencies on long-distance or transoceanic flights were unable to transmit distress signals while still airborne. Search operations over unnecessarily large areas resulted from this limitation. In the future, it is desired that search for a distressed aircraft or its personnel be limited to small areas, thus reducing exposure of personnel to a minimum and eliminating expensive searching operations.

For a civil aircraft, flying at conventional altitudes, only a short time may elapse between the onset of an emergency and the ensuing forced landing. It may not be possible to send a distress signal, since the radio operator or pilot may not have sufficient time to tune his transmitter to the proper frequency and send the necessary emergency data.

It is feasible, therefore, that all aircraft on long-distance flights be equipped with a compact, lightweight, automatic keyer which would turn on a suitable transmitter, choose the preselected distress frequency, key the transmitter automatically (sending three SOS groups—the aircraft identification, a long dash for use by the ground direction finders, and position data), and activate a warning bell, alerting the pilot and radio operator that a distress signal will be transmitted after the period of time required to put the transmitter on the air. A unit of this type is being developed which weighs approximately 5 pounds and will be employed with the standard USAF liaison transmit-

ter, AN/ART-13A. Standardization of the basic functions of such a device on an international basis is considered desirable, and USAF efforts are presently so directed.

One of the more unique projects in the USAF emergency rescue program is the development of a crash locator beacon. It has been proposed that an emergency distress radio transmitter be fitted into an aircraft in such a manner that upon sudden impact, this equipment would automatically and continuously transmit a distress signal. All investigations to date, and all activities, have been concerned with a thorough investigation of past aircraft disasters. This investigation has indicated that the tail section of the aircraft is more likely to remain intact after a crash than such sections as the nose, fuselage, and wings.

It has been suggested, therefore, that radio equipment, to operate automatically at the time of impact and not rely upon surviving members to operate it, be located in the vertical stabilizer of an aircraft. Major problems in the design of this equipment are in mounting it to withstand mechanical stresses and protecting it from the high temperatures caused by fire or the extreme low temperatures of the Arctic region. Providing it with a suitable power supply system—having a long life, self-contained, and operable only when impact has occurred—also is essential.

Improved Gibson Girl

Of the many portable electronic rescue aids under development, greatest emphasis is being placed at the present time on types that can be best described as "emergency radio transmitters and transmitter-receivers." This equipment generally is simple, rugged, and of lightweight construction, and provides a signal on which rescue aircraft may home in azimuth. Work that continued throughout the war on the "Gibson Girl" type transmitter, discussed earlier as the SCR-578, materialized in 1945 as an improved version, the AN/CRT-3, having two channels—500 kilocycles and 8280 kilocycles.

Maximum range of the AN/CRT-3 on 500 kilocycles is 250 to 500 miles at sea and 5 to 10 miles on land, while on 8280 kilocycles it has a reliable range up to 900 miles. Since the transmission automatically alternates every 40 seconds from one frequency to the other, distant ground direction finding stations as well as aircraft and ships in the immediate vicinity are aided in determining the position of stranded fliers. Power is

Vest pocket two-way voice set.

furnished by the hand-driven generator; output is 2½ watts on 500 kilocycles (unmodulated) and 2 watts on 8280 kilocycles (1000 cycle tone modulated). Packed weight, including antenna accessories, is approximately 40 pounds, while the volume is about 5000 cubic inches.

Another improved Gibson Girl transmitter, being developed at the Air Materiel Command, is to include, besides the 500 kilocycles and 8280 kilocycle frequencies, an additional frequency in the VHF band with provision for voice transmission. Present indications are that this set, designated AN/URQ-2, can be built to the same weight and form factor as the AN/CRT-3.

Practical means of incorporating an efficient antenna has been a major engineering obstacle to design of rescue transmitters in the HF band. Antenna of the AN/CRT-3 is wound around a spool contained within the transmitter. Its length is approximately 300 feet, and for successful operation, it must be raised about 100 feet above the life raft. Three devices have been employed to do this. One, a scientific application of a child's toy—the box kite—is generally utilized when the wind velocity is sufficient to lift the weight of the copper wire antenna. The second means is a balloon.

After years of experimentation, the services, in cooperation with the rubber industry, produced a balloon used with some success during the war. Rubber deterioration is still a problem, although when packed in the emergency life raft, the balloon is contained in a vacuum sealed canister. Lighter-than-air gas for inflating the balloon is supplied by a hydrogen generator furnished as part of the emergency kit. Now under development is a blimp-like balloon. This is called a Kytoon by its manufacturer, since it combines the desirable characteristics of both the kite and balloon. It has the stability of a kite and the lifting power of a balloon. In the case of a balloon, wind velocities greater than 25 miles per hour will blow the balloon down to water level.

Because of its size and weight, the Gibson Girl cannot be carried in small aircraft and is often stowed in larger aircraft in such a manner that it is not readily available in an emergency "ditching."

VHF and UHF radio and radar devices make possible the utilization of these line-of-sight frequencies for location and assistance of personnel forced down on water or isolated land areas. Small components are possible, and antenna systems are more efficient at these frequencies, thus size and weight can be reduced materially. (This is true up to 300 megacycles, beyond that increased power supply requirements tend to cancel the gains.) Frequencies are above the atmospheric and precipitation static regions, and are, in general, unaffected by weather conditions. Very high frequencies do not penetrate jungle growths well, however, and are masked by hills, high ocean waves, or other obstructions. Efficiency of propagation is not as dependent upon ground conductivity and dielectric constant as are lower frequencies. For this reason, VHF equipment is useful for air-to-ground communication over tropical, desert, and arctic terrain.

Vest Pocket Two-Way Radio

Several VHF rescue devices are now under development, and one of those expected to be available within the next year is a miniature, two-way voice communication set known as the AN/URC-2. Tunable to any one frequency (preset) between 131 and 141 megacycles, it is powered by a mercury cell battery pack and has a power output of 30 milliwatts. Because of its small size (two units, each 5½ x 3¾ x 1⅛ inches; total weight 3½ pounds), it can be carried in a lifevest pocket. For Arctic use, the unit containing the battery pack can be attached to the body of the user to keep the battery warm and still be connected to the transmitter-receiver unit by a short cable.

Emission of the TN/URC-2 is of

three types—CW, voice- and tone-modulated. In a test of Air Force rescue equipment on Lake Michigan in July 1947, it was conclusively proved that this set will provide two-way voice communication for ranges up to 90 miles from the ground to an aircraft at 10,000 feet. On a 50 percent transmit-50 percent receive cycle, the battery will operate for approximately 50 hours; on continuous tone, it will last approximately 20 hours.

Comparable in size, but intended for tone transmission only, Radio Set AN/CRN-16 is now in the late stages of development. Its frequency will be crystal controlled with one preset channel in the 100 to 156 megacycle range. Designed to fit in C-1 or C-2 emergency subsistence vest pockets, it is composed of two units, weighing a total of 2½ pounds. The transmitter is 5 x 2¼ x 1⅜ inches, while the hand generator is 5 x 2¼ x 1¾ inches. Range will be line-of-sight.

Both the AN/URC-2 and the AN/CRN-16 are expected to be available for simultaneous tests during 1948 to determine if voice communications are desirable or necessary.

Radar Rescue Equipment

Consideration also has been given by the Air Force to emergency radar transmitter-receivers, since equipment operating on the pulse principle can provide searching aircraft with both range and direction indication. In late 1944, the Air Force initiated a development and production contract for a radar sea rescue beacon. Based on a British design, this model, AN/CPT-2, embodied a simple squegging oscillator rather than a true radar transponder, and consequently, indicated only azimuth. Its principal drawbacks were the short ranges obtained (about 20 miles) and an awkward form factor arising because there was no suitable standard battery available to supply the required B-voltage. This necessitated design of the case around a battery totally unsuited to the purpose.

At about the same time, impetus was given to further work on pulse devices by results achieved by two radar technicians of the Heavy Bomber Group, 13th Air Task Force, in the Southwest Pacific. These men, Major Ray Seale and Master Sergeant Edward J. Pekol, utilizing bits and pieces of electronic equipment salvaged at their island base, had constructed 25 models of a crude radar transponder beacon for use by their bomber group. Sent to Wright Field on extended temporary duty, Major Seale and Sergeant Pekol assisted Aircraft Radio Laboratory engineers

Radar set (AN/CPT-2) weighs only 4 pounds, will operate unattended over long periods.

in developing an improved transponder, designated AN/CPN-16.

Experience has shown that AN/CPN-16 provides excellent performance against airborne lobe-switching interrogator-responsor radars. Since it operates on 176 megacycle, a distress frequency being abandoned, further work on this equipment has been discontinued.

Significant possibilities are seen, however, in providing a radar beacon for rescue purposes that will operate with airborne radar equipment now in existence or being developed. A transponder beacon of this type would give the operator of the aircraft's search radar both azimuth and range to the life raft. Provision also may be made for coded communication between the survivors and radar operator, and in addition, the transponder offers the following advantages: Transmission only when interrogated, thus conserving B-battery life; fully automatic operation not requiring attention of distressed personnel: monitoring facilities to determine when an aircraft is within interrogation range.

Since successful use of a radar rescue beacon will be directly dependent upon its operation against suitable equipment universally found in aircraft, Air Materiel Command engineers are investigating the possibility of developing a beacon operable on one of the channels of the distance measuring equipment (DME). The DME, a navigational system presently in development, is intended to provide a pilot with a continuous, visual presentation of the distance and bearing of his aircraft from any point within the coverage of the ground station he may select. Primarily intended as an overland navigational system, the DME would normally be inoperative for navigational purposes during long distance over-water flights, and could serve as a visual alerting and indicating system for reception and display of radar rescue beacon transmissions.

Development has begun on a rescue beacon to work with the DME, the first model to be a simple transponder, receiving uncoded (single pulse) signals from the interrogator in the searching aircraft and returning an uncoded reply to the aircraft responder. It was hoped at the inception of the project that it would be possible to construct a small beacon light enough in weight to be handled as a personalized piece of equipment. The low efficiencies of vacuum tubes at the frequency (1000 megacycles) employed, however, appear to preclude this. Present efforts are being pointed to obtaining a set to be tested functionally with the DME. It may be possible later to obtain a set somewhat lighter and smaller.

Planning and prosecution of the engineering development of the equipment described in the foregoing paragraphs has forced consideration and solution of a great many technical problems rarely encountered in the design and construction of standard ground and airborne equipment for communication and navigation. Solution of these problems has required engineering ingenuity and the evolving, in many cases, of new and unusual techniques. Brief discussion of these points will be of direct interest to those concerned with the design of electronic equipment, and realization of the significance of each should foster in the minds of all a greater specification of the engineer's problems.

Stress On Accessibility

One of the basic design considerations in the construction of any emergency rescue equipment is its accessibility. If, as in the case of the SCR-578, the equipment is to be stowed with the life raft, it must be so placed as to be available during the ditching procedure and have a form factor for easy handling. On the other hand, it seems more feasible to provide the individual man with a personal equipment which he carries at all times, preferably within his life vest or parka.

Weight and frequency go hand-in-hand in design considerations. Low frequency sets, such as the Gibson Girl, require long antennas, complicated antenna raising devices, and large tank circuits. VHF sets can

be built to be carried continually by persons, with little inconvenience; these weigh less than three pounds. Dipole antennas for operation at these frequencies are contained within the basic units and weigh less than one-half pound. Counterbalancing this, VHF sets have limited application (short distances), while the Gibson Girl furnishes ranges in excess of 1000 miles.

Power output is of less importance in the design of VHF sets as propagation is basically limited to line-of-sight ranges. An output of 0.2 watt is sufficient to provide homing signals over ranges up to 100 miles. The improved Gibson Girl will generate an output of 0.25 watt—sufficient to give the ranges indicated. Small transceivers, specifically designed for short distance communication, generate output powers in excess of 30 milliwatts and provide reliable ranges of 40 miles. Successful application of a radar type DME beacon will require a peak power output of 75 watts (7 milliwatts average power).

Complexity of circuits depends somewhat on the modes of transmission desired and the number of operating frequencies required. For long distance transmission, CW signals provide the greatest carrier output. Coded modulated CW facilities permit survivors to give information to direct the rescue mission. Interrogator transponder equipment, of course, provides the searching agency with range and azimuth information.

Whenever practicable, the same tubes are used for transmission as well as reception. In the AN/URC-2, a 2E32 tube and a type 3Q4, respectively, are used as a speech amplifier and modulator when the set is transmitting, and then both as audio amplifiers on reception. Improved Gibson Girl AN/URQ-2 will use the same tube as the 500 kilocycle oscillator, the 8280 kilocycle oscillator, and the VHF power amplifier. Distress frequencies have been chosen so that one crystal produces harmonics to cover more than one band.

Since portable rescue equipments are considered expendable, tube selection outside of the preferred list is permitted, and the necessity for constructing small sets to permit servicing is eliminated. This greatly simplifies waterproofing and construction of hermetically sealed units.

Perhaps the greatest problem rests in providing a suitable power supply. Two practical methods have been advanced to date, batteries and hand generators. Hand generators offer the advantages of long life, operation

Small mercury cell can be carried inside parka for protection.

at extreme temperatures, smaller sizes and weights, and greater dependability. Principal disadvantage is that operation for any length of time requires the services of a man in good physical condition. Cranking the AN/CRN-16 requires an effort of only 6 mechanical watts. Incorporation of a permanent magnet type, high speed generator with an Alnico rotor rather than a shunt generator, has resulted in lower energy requirements.

Improved Batteries

Batteries have the disadvantages of limited shelf and operating life and reduced efficiency or failure at low temperatures. This increases the maintenance problem and limits the usefulness of the equipment under tactical conditions. For example, the power supply of the AN/CPT-2 had a maximum operating life of 30 hours. With the development of the Rubin-Mallory cell, several obstacles have been overcome. Shelf life up to several years may be realized as compared to the three months of older type batteries. RM cells have four times the output capacity and are only one-fourth the weight and size.

Tactically, it may be found feasible to furnish both the battery type and generator power supplies. Batteries would be employed until exhausted, at which time the hand generator could be operated.

To this point, discussion has been confined solely to the problems of equipping an aircraft to transmit a distress signal or furnishing suitable devices to stranded air crews to aid in their location and rescue. Successful employment of these aids, however, is dependent upon the use, by searching and rescue parties, of other airborne, ship-borne, and ground based electronic equipment, particularly of the direction finding type.

Ground direction finders were first used by the British as a navigational device sometime before World War II. In this capacity, "fix" information was supplied by the ground stations to the aircraft via communication links. Position finding, or "fixing" of the transmitter location, was accomplished by plotting information received from two or more D/F stations located at widely separated sites. During the war, this technique was used extensively by all the Allied forces for ground controlled interception (GCI) in conjunction with early ground radars (such as SCR-588, SCR-527, and SCR-627). With development of the Gibson Girl and similar later equipment, this same system was adopted as a sea rescue aid and was instrumental in saving the lives of many pilots who went down over the English Channel.

Direction finding sets may operate in frequencies in the MF, LF, and HF bands to take a bearing on the aircraft or the emergency communications transmitter signal. All employ some type of directive receiving antenna. Size and weight of ground D/F's vary from a few pounds for light portable equipment, to more than 1,000 pounds for precision radio D/F. The latter may be either mobile or fixed.

Useful range of ground D/F equipment depends upon the frequency of transmission, power output of the radio transmitter, location of the radio transmitter, time of day, season, and year. Generally, VHF direction finders are limited to line-of-sight transmissions. HF and LF direction finders, on the other hand, are useful over several thousand miles.

Average probable error of a bearing taken on a ground wave is approximately 1.5 degrees; and for sky waves this probable error increases to approximately 3½ degrees. The accuracy of HF D/F equipment is affected by fading and scattering.

Recent advancement in automatic D/F equipment has resulted in its application in the VHF band to materially increase the capacity of any VHF D/F station. It is expected that continuing advancement in the application of HF technique to goniometers will result in much simpler and lightweight equipment as well

as equipment which will give more positive bearing indication.

Instantaneous type D/F for the HF band has been proposed for use in fixing the location of aircraft engaged in long-distance flying. The D/F may be used either as standard equipment for regular fixing or as a stand-by equipment for fixing on emergency channels.

Use of a panoramic adapter with any of the HF equipments would materially simplify watch on any frequency. Signals received slightly off frequency would not be missed if this equipment were added to present HF sets. This equipment is available and may easily be added.

First airborne equipment used to determine the source of a distress signal was the SCR-269-G, predecessor of present radio compass, which could receive signals from the SCR-578 (Gibson Girl) operating at 500 kilocycles and give a relative indication of its bearing.

Later, an automatic alarm receiver, AN/ARR-6, was developed to automatically receive a 500 kilocycle distress signal and alert the pilot by flashing a red light. This equipment did not give any relative indication of bearing or range, however, and had to be used in conjunction with the radio compass.

Such radar beacons as the AN/CPN-16 and proposed DME rescue beacons are intended to operate in conjunction with standard radar navigation devices employed by military aircraft. Again it may be repeated that this technique provides both range and azimuth information in one operation.

Homing Adapter AN/ARA-8, which was developed during the late stages of the war, is a lobe switching dual antenna, designated to operate in conjunction with the standard VHF communication facilities of the aircraft. This antenna arrangement permits homing on any distress signal in the frequency range of 120 to 140 megacycle band.

An automatic guard channel converter, CV-34/ARC-3 for use in this band recently has been developed by the United States Air Force. This set operates on one channel in the 100- to 156-megacycle band and has a sensitivity of 5 microvolts (50-ohm line). In size it is $7^3/_{16}$ x $5^1/_4$ x $11^1/_4$ inches and weighs $8^1/_2$ pounds.

Buoy Transmitters

War experiences, especially in the China-Burma-India theater, indicated an operational requirement for a rugged, lightweight portable radio set in the HF range. Packaged for dropping via parachute, and sufficiently simple in operation to be used effectively by inexperienced personnel, this beacon could supplement existing or proposed VHF personal radio sets.

Work on a buoy transmitter to be dropped to the surface of the sea, began in the fall of 1942 at the peak of German submarine activity in the North Atlantic. A droppable beacon for marking the point at which the enemy submarine was last sighted was visualized as an aid to combating this menace. The first working model, AN/CRN-1, was developed at Wright Field in early 1943, but tactical models were not produced successfully. By this time the combination of long-range aircraft equipped with search radar had effectively minimized the submarine threat. The requirement of this equipment was then applied for bomber rendezvous operations and sea rescue missions. An improved version, AN/CRN-1A, appeared in 1945 with a sea water activated battery. Design of this model was unsatisfactory, and development is now underway on an improved version. AN/CRN-1(XA-4). Tentative specifications for a rescue beacon droppable over land have been prepared, and work initiated.

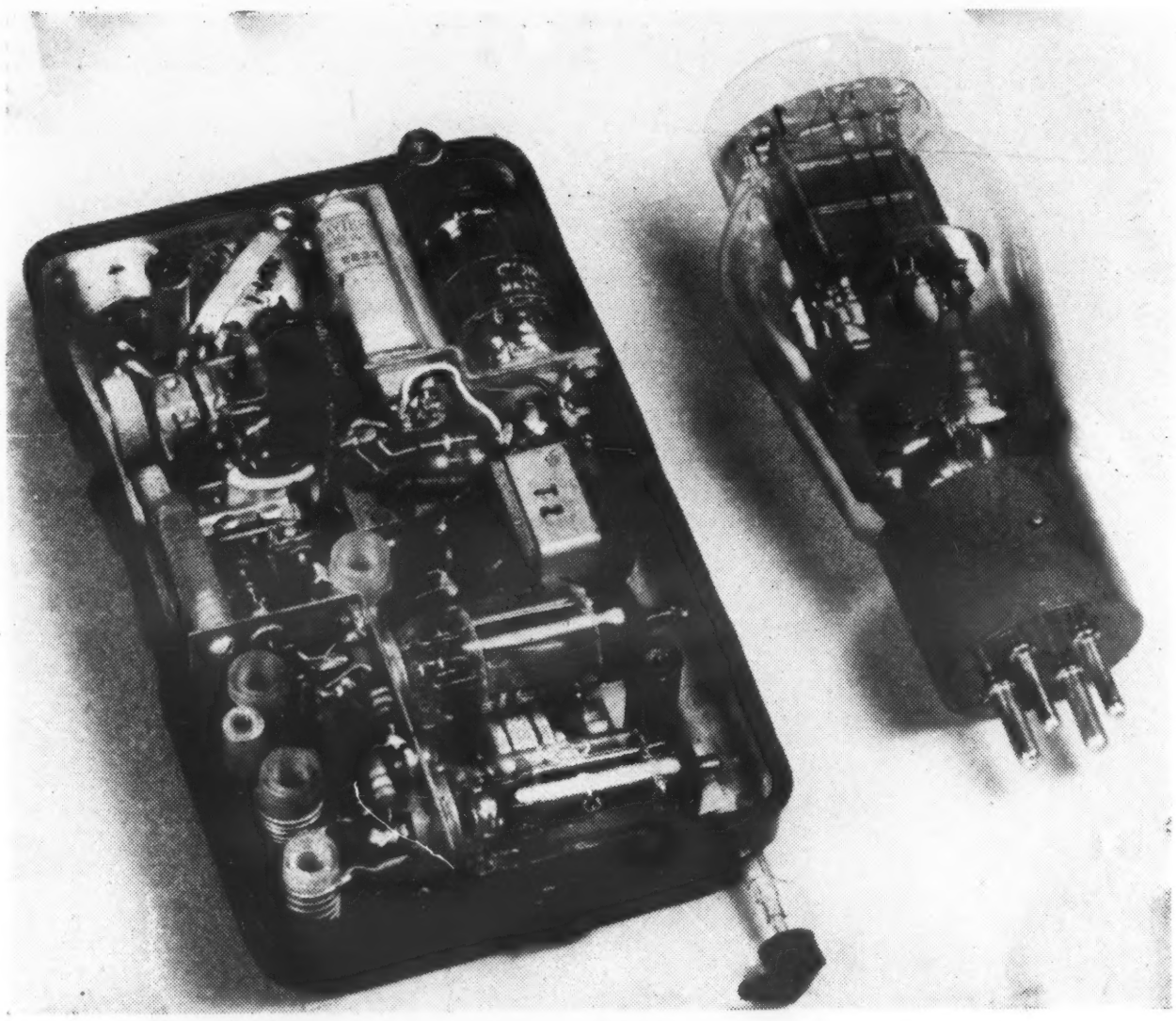
* * *

Extensive as it may seem, the Air Force's research and development of electronic aids to emergency rescue represents only a significant portion of a service-wide, national and international effort. Here in the United States the Coast Guard is often called our "paid fire department" in the field of rescue, and quite aptly, too. In April 1947, the Coast Guard's Eastern Area Coordination Center alone recorded participation in 104 cases involving aircraft and 511 involving vessels or minor mishaps, with the lives and safety of some 1000 persons at stake.

As in the Navy and Coast Guard, development continues in the Air Force on numerous other aids to preserving life and effecting speedy rescue, including improved Arctic, jungle and sea survival kits, airborne life boats to be dropped by parachute, and prescribed procedures for safely ditching aircraft.

Quick and efficient rescue over all the vast reaches of sea and land travelled today, make it mandatory, however, that the problem be recognized for its universality. Facilities for rescue can be found in the aircraft and surface vessels of the United States Navy and in the rescue units and aircraft of the Air Force, plus the communications nets of these services and those of the CAA. In addition, domestic and foreign merchant ships, commercial aircraft and rescue facilities of other nations rapidly rally in response to even the most feeble SOS—the signal that sparks civilized man into humanitarian action regardless of his race, creed, or color.

Compared with regulation size vacum tube, transceiver unit of the AN/URC-2 illustrates size and weight limitations possible.



EDITORIAL

Industrial Preparedness—A National Conviction

World War II experience in mobilizing the industrial strength of our nation to back our men in arms confirmed the claim of a number of our country's outstanding thinkers that adequate industrial preparedness planning measures against a national emergency must be accomplished in peacetime for orderly implementation in the event of an emergency.

That confirmation has grown into a national conviction. We must be prepared always if we are to safeguard our own freedom and the freedom of weaker nations against totalitarian aggressors.

American convictions generally manifest themselves in action, and the American people, through Congress and the President, have acted to take industrial mobilization planning out of the conversational stage and make it into a growing form of preparedness. Since the end of the war many things have happened, and the way has been provided for the accomplishment of many other things which, cumulatively, will make it possible to harness our massive industrial strength quickly and efficiently should the enemies of freedom ever strike.

Our nation is building a huge stockpile of strategic and critical materials—materials without which we could not fight a war, and which must be transported thousands of miles across oceans which become increasingly hazardous during a war. The 79th Congress passed a law providing the stockpile, and one hundred million dollars with which to purchase materials. The 80th Congress voted $175 million last year, and this year another $525 million for stockpiling purchase. All in all, including materials in residue from World War II, a stockpile evaluated at over six hundred million dollars has been accomplished. If all goes well it will be double that value with the expenditure of the new funds. The Munitions Board is charged with the administration of the Stockpiling Act with the Federal Supply, Treasury Department, doing the actual purchasing and storing.

Shortly after World War II the Armed Services in conjunction with the old Army and Navy Munitions Board began a program to preserve some of the great productive capacity built by the United States Government during the war. Hundreds of plants worth billions of dollars were retained in an industrial reserve. Others were preserved by including the National Security Clause in the sales contracts of the plants. The National Security Clause provides that the designed productive capacity of the plant will not be altered in any way which will prevent its rapid reconversion to war production in the event of an emergency.

In addition to the preservation of industrial facilities, thousands of vital machine tools have been retained in the industrial reserve. In this one activity, a potential scrap heap was converted into a great preparedness potential.

Just prior to adjournment, Congress formalized the National Industrial Reserve by passing a law, which provides that the Federal Works Agency will hold and maintain these billions of dollars of tools and facilities. This reserve will go a long way toward insuring quick industrial mobilization if an emergency should occur in the future.

Economic and efficient military procurement is essential in achieving orderly mobilization of our industrial power, and much has already been achieved. Much more will be achieved in the future.

To date about sixty-five percent of the dollar value of current procurement is coordinated through the method of single service procurement responsibility. Single service procurement means that one of the armed services does the purchasing of a specific group of commodities or items for itself and the other two services. About thirteen percent of the dollar value of current procurement is coordinated through joint procurement agencies, while approximately six percent is coordinated by means of collaborative purchasing, leaving only sixteen percent uncoordinated at present. Within a short time, it is anticipated all military procurement will be coordinated, primarily through the medium of single purchase responsibility.

This type of purchase coordination is a great stride toward achieving the desired efficiency, economy, and implementation of combat efficiency, but it is only part of the tremendous task. The development of a common catalog for the services, common procurement regulations, and standardization of equipment are also essential, and it is good to report that work is already in progress in the development of standardization and the common catalog, and that the armed services will be publishing the last sections of their uniform procurement regulations about the time this editorial is being read.

Military requirements in war are the base from which industrial mobilization planning must be built. These requirements, of course, stem from the Strategic Concept developed by the Joints Chiefs of Staff. To date, much progress is being experienced in this field, and the methods and procedures for developing these requirements, which is an extremely difficult process, are becoming better and better through experience.

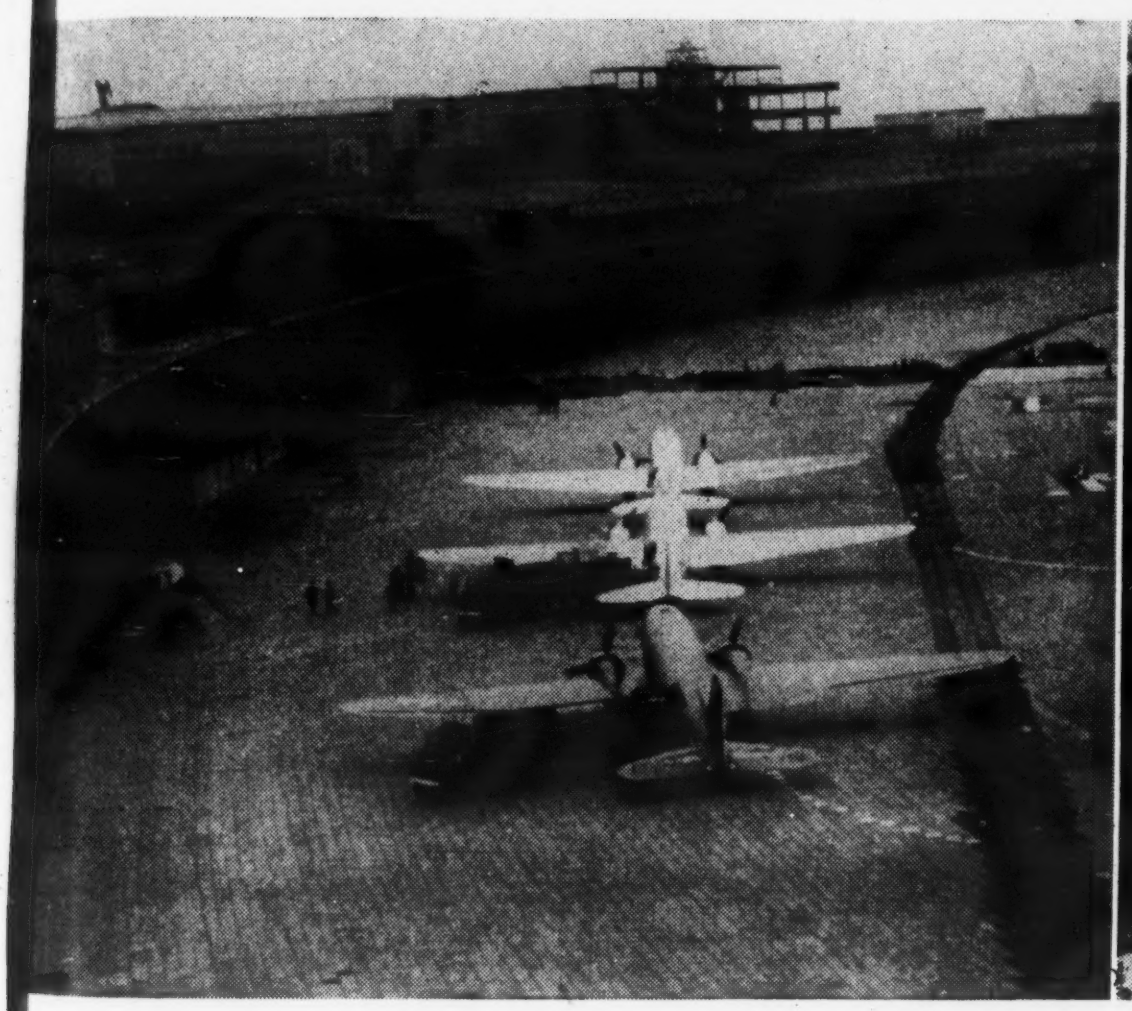
Advance is also being made in the development of an accurate knowledge of the source of supply for wartime military procurement. Thousands of private industrial capacities have been allocated to the three services for procurement planning purposes, and the services will contact the management of these facilities to work toward the development of tentative wartime production schedules.

In every aspect of industrial mobilization with which the Military Establishment has been charged, great advances, paralleling the advancement made in the public's realization of the necessity of such preparedness and their implementation of that realization, are being made. But the task is far from being completed. Actually, it never will be completed; it is an evolutionary process contingent on our ever-changing world. Yet, because industrial preparedness is now a national conviction we have acquired the right stride and can advance with courage toward our goal—achieving peace through national preparedness.

Thomas J. Hargrave, Chairman
Munitions Board
National Military Establishment

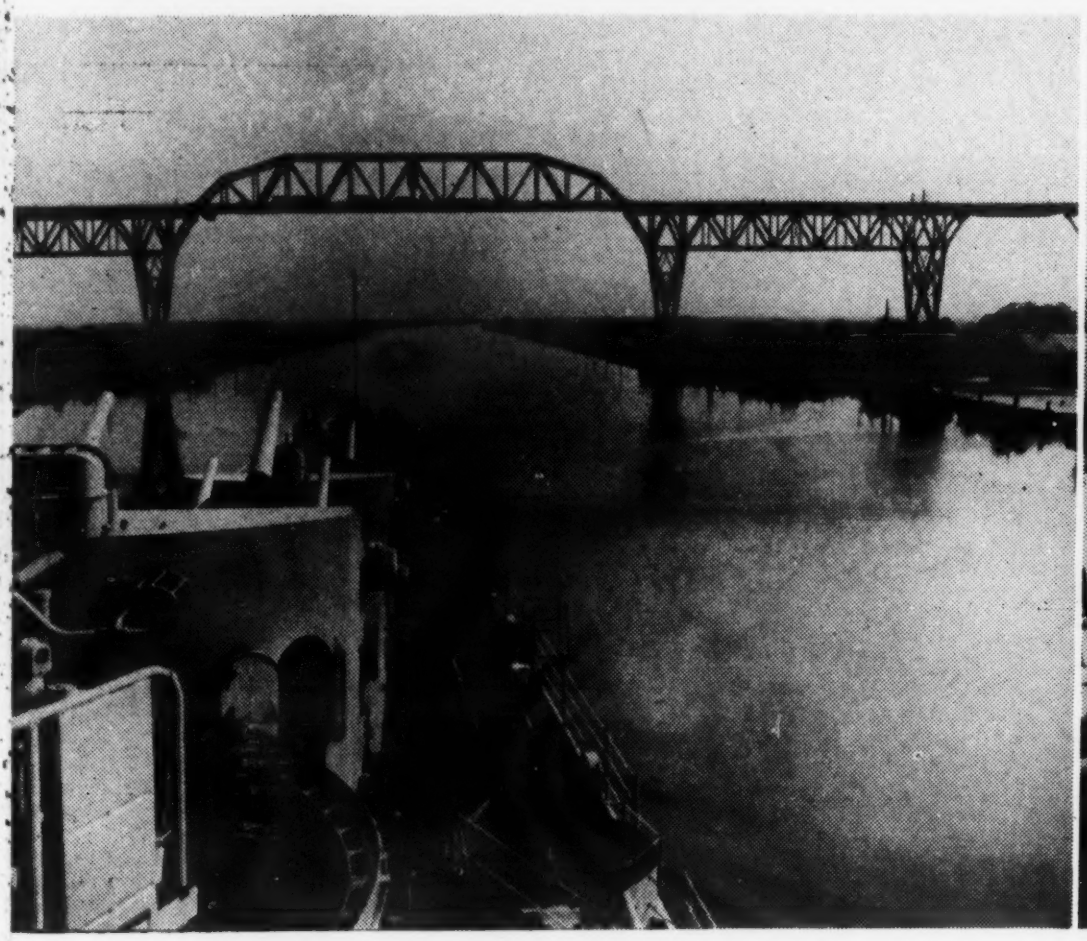
PHOTOS *In the News*

Operation "Vittles"—flying supplies to Berlin. Scenes from Templehof air base.



Freight must also be flown out of Berlin. Below, household goods belonging to transferring U. S. personnel wait inside a hangar for unloading into cargo planes.

The Navy is in Germany too. In addition to fleet units assigned to Northern European waters the Navy has personnel at Bremerhaven, Frankfurt, and Berlin. Below, the USS *Fresno* transits the Kiel Canal.



Below: The Soviet travel restriction keeps barges tied up on German inland waters.

Above left: Members of Army units in Japan were guests of the Navy for a cruise aboard the USS *Toledo*.

Above right: A Lily replaces the Rose. T/Sgt. Lillian Zibbe is the disc jockey at WVTR, Radio Tokyo.

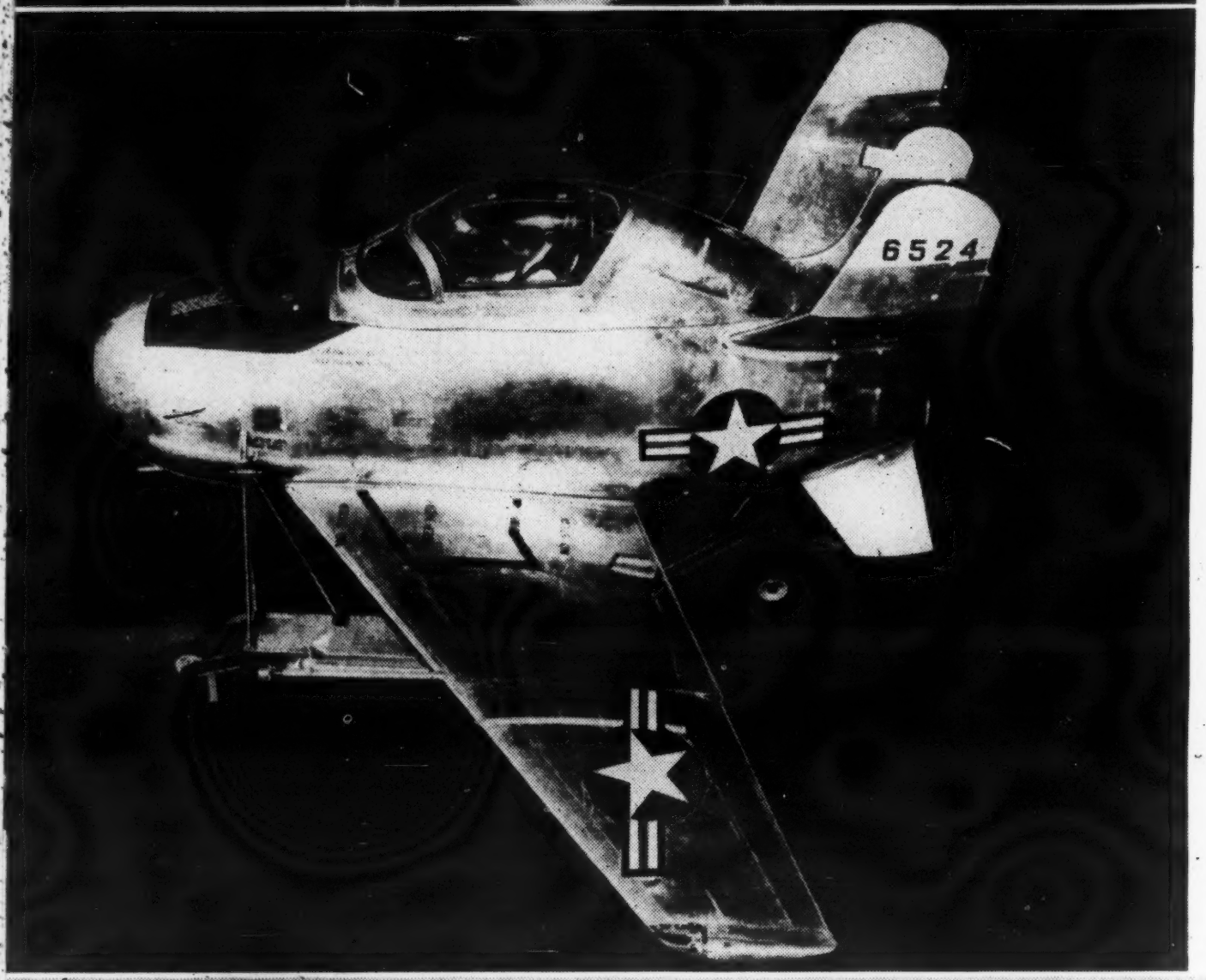
Center L: Funeral services for the late Rev. Msgr. Edward J. Flanagan held at the Holy Rosary Church, Berlin-Steglitz.

Center R: Command Post Experiment in Germany. Command Posts, connected by a complex signal communication system, were set up recently in simulated combat conditions.

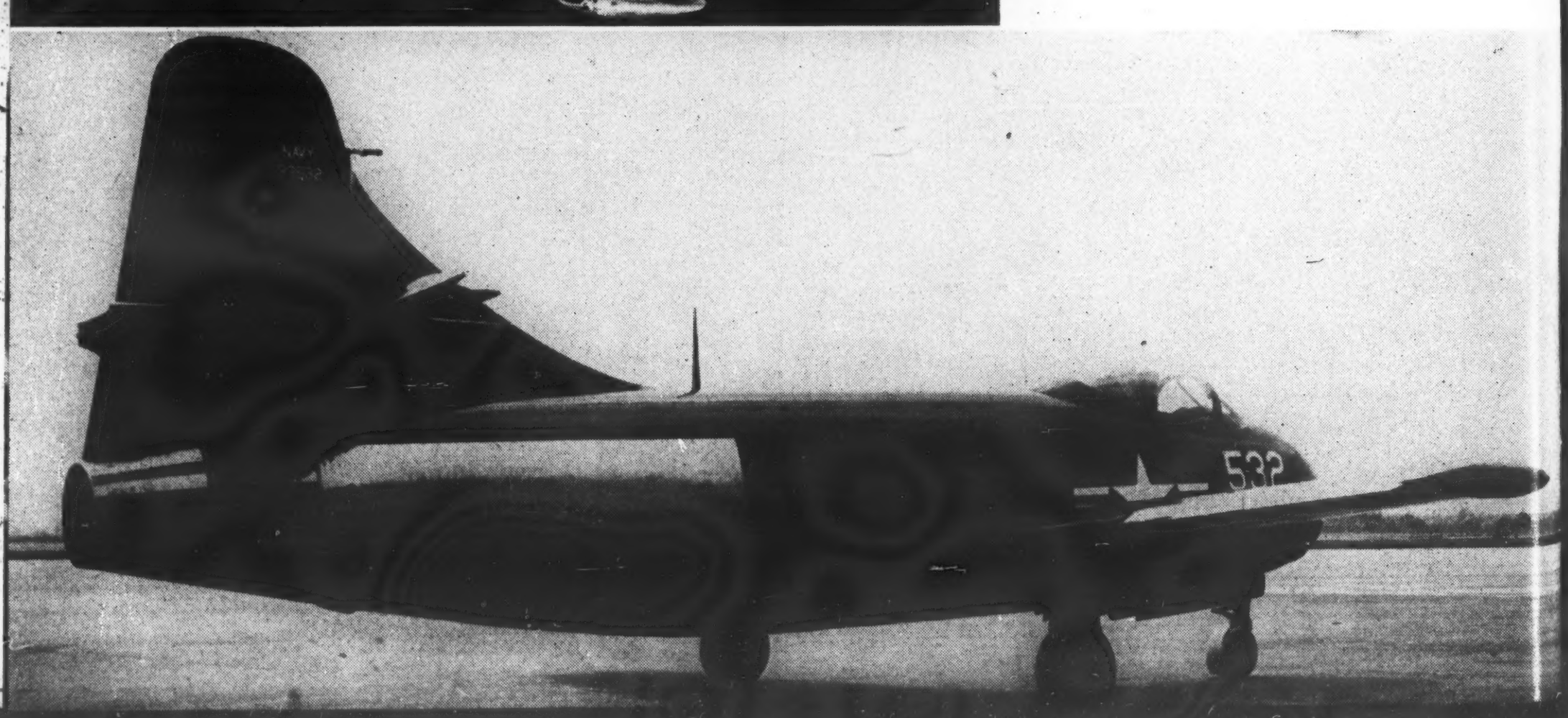
Bottom: Nursery school children celebrate with a party the thirty-first birthday of "Kaiser," famous pigeon of World Wars I and II.

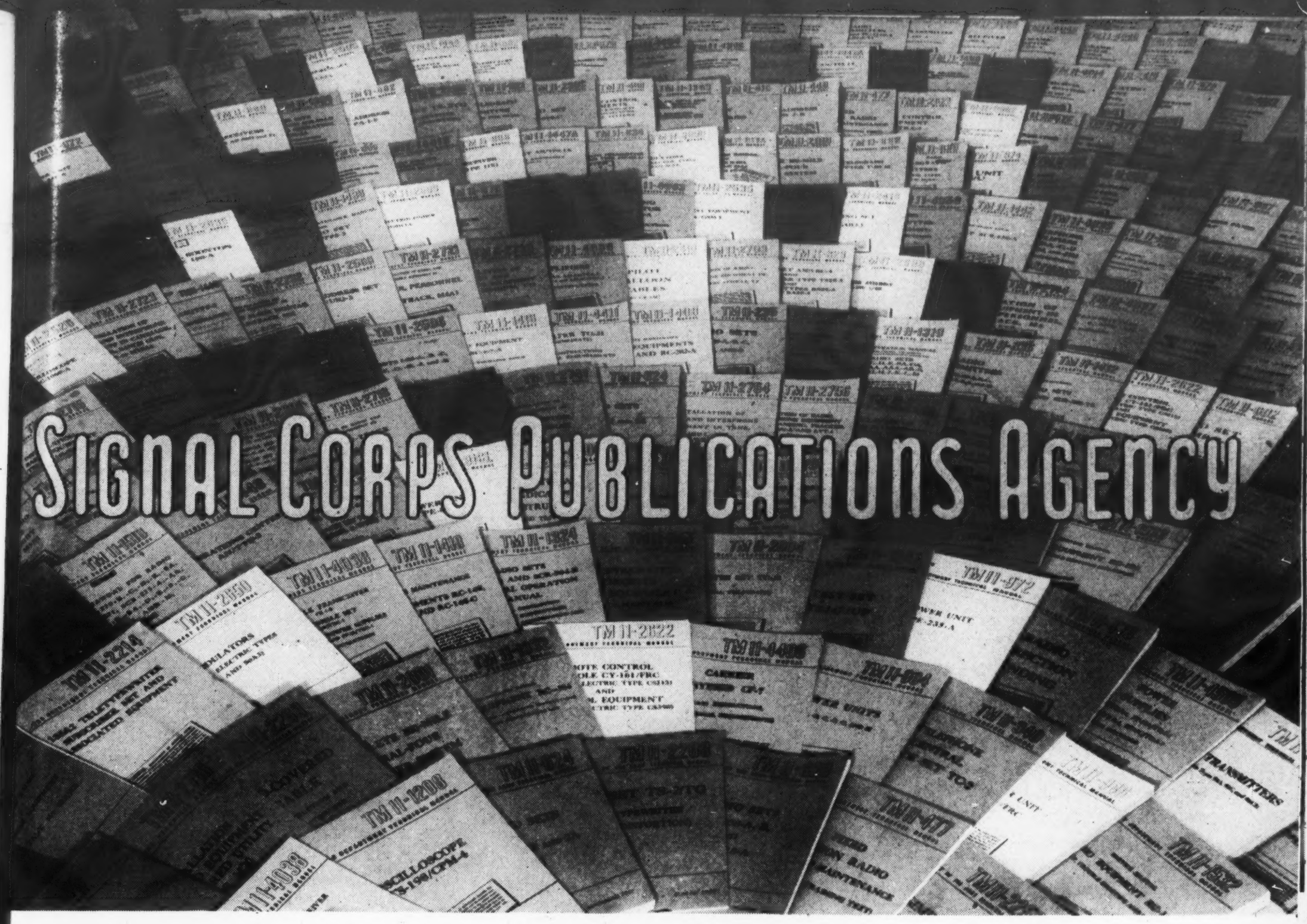
The Air Force may soon have "carrier" craft too, for such planes as the XF-85, at left, are designed to be launched from and picked up by large planes. Mounted on a dolly in these pictures, the little fighter plane actually has no landing gear.

The outline of the XF-85 recalls the old quip of aircraft design engineers, that because of the proportions of the bee it was aerodynamically impossible for it to fly. The somewhat bee-shaped XF-85 would make it seem that the design engineers have changed their opinion.



Below: The Navy says its XF6U-1 "Pirate" fighter will be equipped with an "afterburner," an auxiliary jet unit which greatly increases the power of a jet turbine engine for short periods. View shows modification of tail section to accommodate "afterburner."





By Col. A. J. Mandelbaum

In peace as in war the degree of training of the soldier measures the degree to which he can contribute to ultimate victory in war. This vital training comprises a basic technical background, and the ability in certain circumstances, together with the proper tools and information, to come up with a solution. The great scientific and engineering accomplishments of this electronic age are valueless in the hands of a soldier who lacks either the technical know-how or does not have a ready source for finding the information he needs. A most important single measure in imparting this know-how to the soldier is through the media of instructional literature.

From the time a soldier is first brought into the communications field, his training in general theory and doctrine is based on technical manuals covering the pertinent subjects. As he progresses and specializes, he learns the detail of specific types of equipment, which information he obtains primarily from technical manuals. When he departs for the field, he finds a technical manual accompanying his equipment, to which he can refer when he gets into a "spot."

Ubiquitous TM's

For example, in the recent war, Technical Manuals—better known as TM's went with equipment and signal troops all over the world. They helped soldiers operate the numerous types of radio equipments, high power or hand-carried, in snowbound outposts in Greenland, in palm-thatched huts in Burma, and in the jungles of the South Sea Islands. A TM helped a crew set up an SCR 271 radar in New Guinea, helped a sergeant rewire a radar scope in Oran, helped a corporal repair a burnt-out generator one night in the Siegfried line.

There is a TM for each kind of Signal Corps equipment—from cameras to coaxial cable, from repeating coils to radio transmitters, from dry cells to direction finders, from record players to radar stations. For a thousand different types of equipment there are a thousand different technical manuals; with millions of copies which have been and are being published and distributed to the school and in the field.

These technical manuals comprise fundamentals manuals, equipment manuals, field manuals, technical bulletins, modification work orders, lubrication orders, supply catalogues and bulletins, contributing to a total of printed literature equivalent to that of the largest publishing companies in the country.

This entire output has the end mission of insuring that the soldier in

the field is properly trained, and has a helpful reference to accomplish specific jobs.

Responsible for this tremendous output of technical and tactical signal material, with an enviable record of war and post-war production, is a government agency at Fort Monmouth, New Jersey—The Signal Corps Publications Agency.

SCPA Specialists

The Signal Corps Publications Agency—in common parlance, the SCPA—is a unique organization. It is the catalyst between science and the soldier. A field agency of the Chief Signal Officer, the SCPA is an organization of specialists—both military and civilian—which is charged with the preparation of all official Signal Corps literature.

Preparation is interpreted in the broad sense. It includes planning and outlining the manuscript by assigned SCPA technical writers (who are engineers and specialists in their fields); the rigorous research of new equipment,—highly complex in most cases; photographic illustration—in which items are photographed, developed, retouched, and printed at the SCPA Photo Laboratory; circuit diagrams, line drawings, cut-aways, exploded views, isometrics, art illustrations—accomplished by expert artists and draftsmen in the Art and Drafting Branch of the SCPA; writing, editing—technical and grammatical, —review, and typing in final form for submission to the Chief Signal Officer. The work of the agency includes review, re-writing, and editing of manuscripts prepared by private contractors, to insure their conformity with established standards of the Department of the Army.

Although all the personnel of the SCPA contribute according to their specialty to the completion of a writing project, the key man is the technical writer. Upon him rests the planning, the allotment of parts of the task (such as photo or art work) to supporting personnel, the actual writing, and the follow-through to final submission of the manuscript.

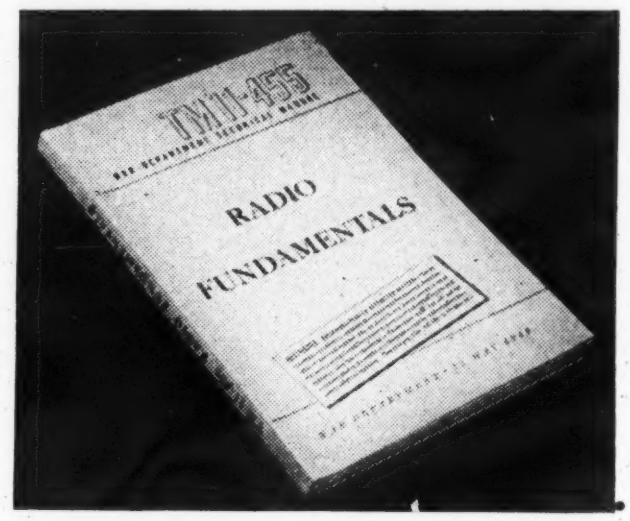
Engineer Writers

The technical writer has dual qualifications. He must be an engineer; he must be able to analyze the most complex and detailed scientific reports, engineering data, and pieces of equipment. He must understand the theory and operation of each component. Again, the technical writer must be able to express himself in print, in simple, direct language which can be understood by the average soldier. His text must be clear, factual, and immediately applicable to its reference equipment. He must have an ambidextrous mentality which not only knows the characteristics of electronics, but by which he can get down to earth and say "Look, Joe, it works like this—."

The day is past when a man can observe another man waving two flags, and with simple oral instruction become a signal specialist himself within a short time. With the increasing complexity of modern electronic equipment, the technician must have a clear, concise printed text to guide him.

TM A Requisite

Thus the TM is most in demand. In it the esential information is pre-



sented in a systematic and uniform manner. The equipment is described and illustrated. Its application, powers and limitations are indicated. Its assembly, installation, and operation instructions are precisely detailed with suitable diagrams and illustrations to assist. Maintenance and lubrication instructions follow, to insure continued successful operation. Repair instructions, and a parts list conclude the manual. Depending on the contemplated application of the equipment the manual may contain additional instructions for packing and crating for sea or air voyage, use of pertinent test equipment, tropical or arctic precautions, safety measures, etc. The TM can be used in a school for a reference text, in the depot for repair and service of equipment, and in the field where the equipment must be installed, and operated in minimum time.

Consider the plight of a field soldier, specialist though he may be, who opens several crates of a new type facsimile or multi-channel radio equipment which includes a variety of cables, spare parts, and adjusting tools,—but fails to find any literature telling how it is assembled, how it is adjusted, and operated, or what it can or cannot do.

"For want of a nail—a kingdom was lost;—for want of a book—."

TM's As Text Books

It is for this reason that the Chief Signal Officer has prescribed that not only will a manual be prepared for each new type of equipment procured for the Army, but that two copies will be packed with each unit in the factory, and will accompany the unit wherever in the world it may be sent. Thus, with each type equipment procured, a technical manual must be coincidentally prepared.

Of particular interest is a series of books on basic and fundamental electronic theory,—progressing from the electron to television, and other equally complex fields—to provide a uniform set of texts and reference work for all schools and students of the Army. This project comprising 27 "Fundamentals" books has been and is currently being prepared by the SCPA. Of these, the book on "Radio Fundamentals" already completed and in print, has proven most popular. A distribution of more than 275,000 copies has been effected—recording the greatest number of copies printed of any Signal Corps publication. The total books of the "Fundamentals Program" are expected to be completed late in 1949. These books are also used by the Air Force, and the Navy is currently studying them with a view to adopting them.

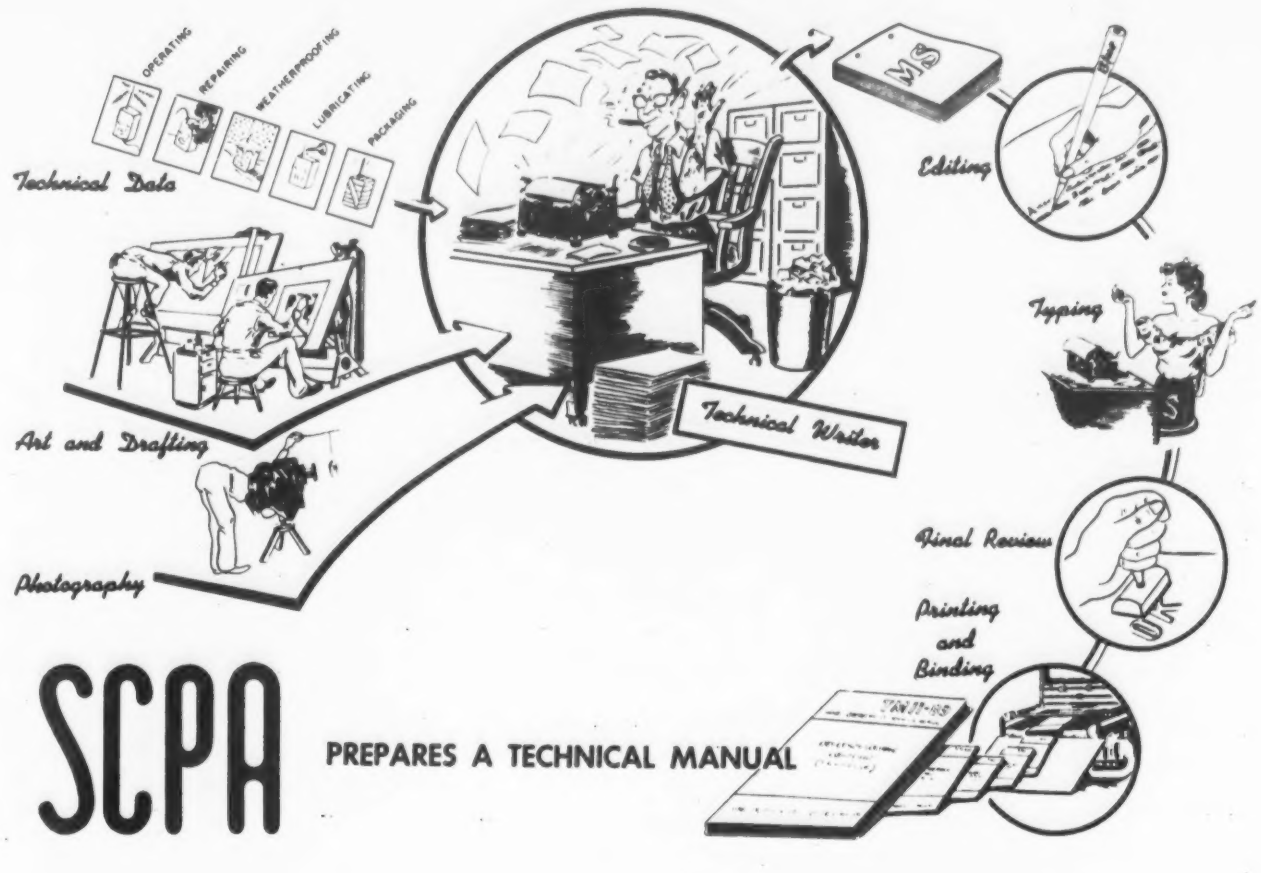
Field Manual

Another type of publication which serves an essential need is the Signal Corps Field Manual. These are tactical in nature, containing the doctrine, principles, and procedures for the tactical employment of the various signal communication and electronic means, and the various types of Signal Corps units and organizations.

In the preparation of field manuals the SCPA employs only military personnel. It takes advantage of their military experience, and that of others who may be considered authorities in the various fields covered in such manuals.

The above is but a very brief picture of the functions of the SCPA.

Although conceived and born in its present form in the troubled confu-



sion of the early war years, the SCPA had peaceful and more humble origins. These origins were three in number; The Department of Training Literature of the Signal Corps School, The Instruction Literature Section of the Fort Monmouth Signal Laboratory, and The Technical Publications Section of the Camp Evans Signal Laboratory—all located in or near Fort Monmouth, New Jersey.

SCPA Beginnings

Oldest of these, the Department of Training Literature was initially established as part of the first Signal School at Camp Alfred Vail (now Fort Monmouth) in 1921. It is significant that the importance of literature was realized over 25 years ago. Through the years that followed, the Literature Department prepared extension courses for Reserve Officer training, entrance and promotion tests for enlisted men, school texts, and at long intervals, an occasional field or technical manual. Staffed solely with officers, the Literature Department was continually plagued with a shortage of manpower. In 1927 the total Department strength was one officer. Within ten years the roster increased to four officers. On December 7, 1941, the Department of Training Literature consisted of only ten officers.

At the Signal Corps Laboratory, the Instruction Literature Section, small in size, prepared operation and maintenance pamphlets for equipment newly developed in the laboratory. During the pre-war years when lack of funds curtailed equipment production, the output of this section was correspondingly low. This section initially processed the first manuals prepared by equipment manufacturers as provided in their contracts.

At Camp Evans, site of considerable radar development, a few tentative but massive publications on radar were produced by their publication section.

Wartime Growth

The total strength of these three agencies was quite minute as compared to the maximum SCPA war strength of nearly 650 personnel two years later. At the outbreak of the war there was no coordinated program for the production of technical literature. The various service schools used their own texts, some good, some bad. There were few types of Signal Corps equipment as compared to the tremendous number procured during the war. Radar and other special electronic applications were "hush-hush," and were so secret that only extremely limited distribution of prepared literature could be made.

At the outbreak of the war there were well-organized plans for the development and procurement of Signal Corps equipment. Little thought, however, had been given to its companion, the technical manual.

Makers Fail On Literature

Although the contracts initially awarded required two instruction books to be packed with each piece of newly manufactured equipment crated for shipment, few manufacturers could or would prepare such literature. Assistance was offered by the three writing agencies at Fort Monmouth but the task was too great. Frequently manufacturers were unaware that a literature clause existed in their contracts until too late, until equipment was rolling off the production line, and was being packed. Others were aware of the clause, but simply lacked the facilities or organization to prepare their prescribed literature. They were equipment manufacturers, not writers, or publishers, they claimed.

Although some manufacturers did supply literature, when others failed to do so, the task fell chiefly to the understaffed and over-worked Instruction Literature Section of the Signal Corps Laboratory. This section struggled valiantly with the problem during the first one and one-half years of the war. But as the volume of development and procurement soared, the limited facilities of all three writing groups were swamped.

The result of this situation was that more and more equipment of every type and variety was being shipped overseas without technical manuals to accompany them. The reaction was loud and vociferous.

Equipment shipped to every corner of the earth, when unpacked in many, many cases, lay useless and idle because the local officers or technicians did not know how to assemble, adjust, operate, or maintain this new equipment. When an air base in the Pacific suffered heavy casualties, and widespread destruction of planes and supplies, because it was not alerted to a Jap air raid, and the radar set which could have given that warning was on hand but inoperative, for lack of an instruction book, the returning clamor was naturally vitriolic and violent. This clamor for literature was not confined to a few isolated cases but rather came from all theaters of operation around the world.

SCPA Activated

An investigation—in the summer and fall of 1943—revealed the chaotic condition. A move was made to combine the three literature-producing groups at Fort Monmouth, and provide them with the needed manpower, facilities, and the mission —to prepare and produce adequate literature needed both in the field and in the training schools.

On November 20, 1943, the new organization was activated — to be known as the Fort Monmouth Signal Corps Publication Agency.

Personnel of the Department of Training Literature were the first to occupy the selected site of the new Agency. They were soon joined by personnel pooled from the Instruction Literature Section of the Fort Monmouth Signal Laboratory, and from the Technical Publications Section of the Evans Signal Laboratory.

Race With New Equipment

With an existing work load and back log of overwhelming proportions, the original nucleus of 167 people was only one-quarter the number needed. Military files were searched for qualified personnel, officers or enlisted men; qualified civilians were sought through Civil Service. Gradually, one by one, capable writers, editors, proofreaders, typists, illustrators, draftsmen, artists, photographers, and other technical personnel were employed. By the first of January of 1944, the number exceeded 400 —most of them specialists.

But even as the personnel of the agency increased, the work load climbed to such enormous proportions that it seemed at times almost futile to attempt completion of the hopelessly large number of literature projects. An example was the radar problem:

Billions of dollars had been spent on highly technical radar equipment but again little concern had been given the imperative need for adequate technical literature. One reason for this was the assumption that school training—at the various basic and specialist schools—was quite sufficient, and that little further instruction was necessary. Despite the complete and thorough training given in Signal Corps schools, when soldiers reached the field they invariably encountered different or new radar equipment with which they were unfamiliar. At that time, the need for proper maintenance and repair of all radar equipment was not only vital to the nation's defense but an urgent requirement in forward combat areas.

Race Almost Lost

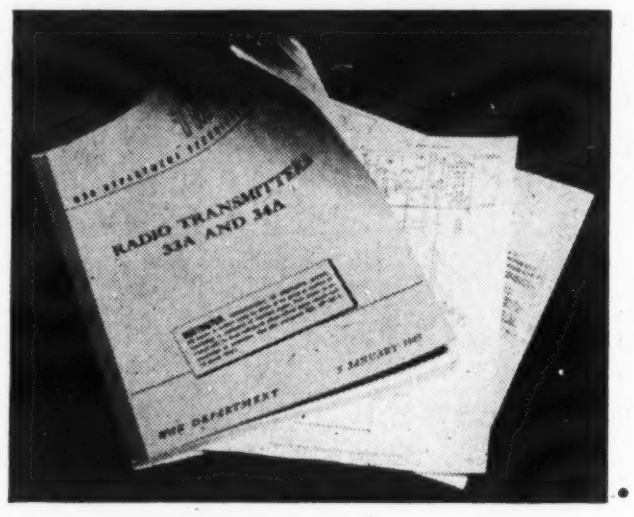
The only solution again was sufficient training literature and technical information for each of the many types of radar sets. The preparation of appropriate technical manuals for radar, as well as the reduction of the vast back-log was enthusiastically tackled by the Publications Agency.

So top-heavy was the work load during the spring of 1944, that it often threatened to overwhelm the SCPA. High-speed mass-production systems were introduced, however, and writers and editors alike became experts at cutting corners. Teams of writers and editors were often sent directly to equipment manufacturers to assist on the spot in the preparation of adequate literature required to accompany equipment which was actually in production at the time.

Field teams of 10 to 15 writers, editors, and assistants often worked directly with a contractor and his printer in order to expedite every phase of TM preparation and production.

Race Won

As an example, during the late spring of 1944, the SCPA set a goal of 90 days for the completion of technical literature to cover 60 major types of radar equipment, for which



there were either none, or very sketchy instructions — an impossible task! Working around the clock, with no regard for hours or days off, the task was better than accomplished. On a certain hot summer night in 1944, a little group of military and civilian personnel carefully wrapped for mailing to the printer, the final manuscript for the 60th item of radar equipment—exactly 60 days from the start of the program.

Every member of the Agency considered it a moral obligation that technical manuals be packed with every piece of Signal Corps equipment—at the time of packing and crating at the factory. There was too much possibility for failure to "marry-up" separately shipped manuals with their companion equipments.

Occasional overseas reports of nonreceipt of technical manuals were investigated. And in each instance it was usually found that the books were missing because of unauthorized removal by well-meaning, classification-conscious security officers, or, because of petty pilfering by unconscientious kleptomaniacs somewhere along the line of shipment.

With a peak personnel total of nearly 650 persons in June of 1944, the agency was still engaged in constantly expanding operations. New equipment—as well as changes in old equipment—required the continuous production of new literature. During this time were developed the style and literary standards, which were later adopted by other arms and services. Every conceivable effort was made to provide the best training literature and technical publications for *the average soldier*. On the whole the efforts of the SCPA must be considered successful.

For the unique accomplishments of SCPA in the preparation and production of consistently high-caliber instruction literature, the agency was awarded the Meritorious Service Unit Plaque in May of 1945.

But for more tangible evidence of the accomplishments of SCPA, pick up a late Signal Corps TM, field manual, or other publication. Glance at the perfected product which represents several million man-hours of effort and experience in writing and producing good literature. There is a lot of research, planning, and execution behind every slug of type.

TM Essential Equipment

In preparedness talks of today strong emphasis is placed on the vital need for scientific and technological research and development, for if ever again the security of our nation is threatened a successful defense will almost certainly depend on the scientific and technological advances we have made over a possible enemy. Yet, the full measure of our security must include our ability to maintain the individual's preparedness with a high standard of training.

The scientific and technological advances we have made must ultimately be translated into terms understandable to G. I. Joe—the man who is going to do the job. The printed word is as much an essential as any other part of Joe's equipment. The technical manual is an integral part of his ultimate effectiveness.

If the lesson has been learned, from the past war, there will never again be shipped a piece of Signal Corps equipment which does not have its manual integrated with it. The Signal Corps Publication Agency is dedicated to that task.

NAVAL RESERVE COMMUNICATIONS

In case of emergency—"call your local Naval Reserve unit."

The word is getting around that the minute men of the Navy's shore-bound alumni are ready and willing when a local emergency arises, whether it be a flood, hurricane, forest fire, communications failure—or an atomic bomb.

This isn't anything new to the Navy. From the time of its origin it has been subject to emergency calls wherever disaster has struck in the nation.

But with its new postwar Naval Reserve which now has an enrollment of more than 900,000, the Navy, while not essentially a land activity, has already demonstrated its value as a local home guard unit.

Nucleus of the naval home guard in the community is the Naval Reserve Training Center, of which 322 units will be completed by 1950. More than half of these units, the total number of which will house approximately 764 divisions of the Organized Reserve as well as associated volunteer units, have already been officially established.

Located not only at coastal cities, the Navy's Reserve organization has spread throughout the country, from Woonsocket, R. I., to Vallejo, Calif. Reserve units will be able to play their role, in the event of disaster, in such communities as Tuscaloosa, Ala., Kalamazoo, Mich., Kenosha, Wis., Hannibal, Mo., and Albuquerque, N. M.

Linking the Navy even more closely with the home community is the rapidly growing network of Reserve radio station in NRTCs, and "ham" radio stations manned by Reservist amateurs, which will establish a nationwide chain of communications units on tap in the event of disaster.

In case of a crisis, ranging from a local fire to an enemy attack, this growing network may be called to duty and could take over the handling of government radio traffic. Control points, calls and procedures have been set up for this purpose. Emergency equipment and teams are being organized for all contingencies, operating under the Reserve's "disaster plan."

Providing communications during a public emergency is one of the most important functions of the Naval Reserve electronic warfare program. Broad in scope and precise in its methods, the electronic warfare program embraces training in communi-

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Rear Adm. Earl E. Stone, USN,
Chief of Naval Communications

In the event of local disaster or emergency, we have directed our district communications officers to be prepared to coordinate amateur and Naval Reserve networks. Just recently I received a long message from the flooded Columbia River area, from which I will quote a small portion—quote: Electronic warfare company 13-4 of Longview, Washington was operating an emergency radio station at West Kelso Flood Headquarters day and night and reported working with radio amateurs in area in coordinating relief and dike work: unquote. That is a typical report. In such local disasters we have obtained the finest results by coordinated amateur and Naval Reserve efforts.

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cations, CIC, anti-submarine warfare and technical electronics, as well as electronics as related to guided missiles, infra-red and nuclear physics.

With the Navy supplying electronic equipment and paying for installation and maintenance, the electronic warfare program is an opportunity for young men to accomplish new skills and maintain proficiencies learned during wartime with equipment not available to the ordinary citizen. Both operators and technicians are afforded full use of printed material and actual experience with electronics gear of all kinds.

Some electronic warfare personnel are assigned to Organized Reserve units and other personnel in the Volunteer Reserve are integrated into electronic warfare companies and platoons.

For planning purposes, a quota of 900 companies and 5,000 platoons is the goal of the Volunteer electronic warfare program. Each company will have five officers and 40 enlisted personnel, while the platoons are comprised of one officer and nine enlisted men.

Volunteer Reserve personnel may participate in Organized Reserve drills and may serve as instructors and consultants in the training program.

Volunteer companies and platoons will use the facilities and equipment in Organized Reserve armories and some units will have their own buildings, designated as electronic warfare drill quarters.

Cruises On AGC's

Most of the equipment initially provided electronic warfare units comes from shore establishments which have been closed, and additional gear has been made available from decommissioned ships. Some new equipment which was bought by the Navy during the war but never used has been turned over for Reserve training. Hereafter, appropriate quantities of all new electronic gear purchased by the Navy will be allocated to the Naval Reserve as well as equipment purchased solely for the Reserve. More than $100,000,000 worth of equipment is being utilized by electronic warfare personnel throughout the nation.

Training methods in the armories include classroom lectures by regular instructors and visiting lecturers, maintenance and operation of equipment in Naval Reserve shore facilities and ships, assignments of laboratory problems and homework, extensive use of training films, recordings and correspondence courses, visits to manufacturing plants and naval and civilian laboratories, and the widest possible use of regular navy activities.

For training at sea, electronic warfare personnel may take their annual training duty aboard two AGC's equipped with extensive communications and radar equipment. USS Taconic and USS Pocono started the Reserve cruises for electronic warfare personnel during the middle of July. A total of 14 cruises aboard these two vessels are scheduled through October for Reservists from naval districts east of the Mississippi and the 9th ND and requests for this training should be addressed to district commandants.

Cruises on the above ships are in addition to the opportunity for electronic warfare reservists on regular Naval Reserve cruises, such as one aboard USS Wisconsin and on annual midshipman cruises.

Land Model of Cruiser Gear

For the training of CIC personnel in armories, a new model now in the planning stage will approximate a cruiser's most modern gear, embracing radar, sonar, radio, infra-red and visual detection and communication equipment.

The test model, when completed, will be located in a Reserve armory and will embrace all the latest CIC concepts and procedures. Readings will be recorded and the functions of CIC plotting and reporting will be carried out the same as at sea.

BuShips will develop the plans, furnish the equipment and install the model trainer, with the primary goal being that the device must provide the maximum training possible in a Naval Reserve armory.

From the test model will come the plans, specifications and equipment lists for subsequent devices which will be constructed for other Reserve units.

In the meantime, CIC personnel continue their training to the fullest extent possible with the facilities now provided in the armories and at fleet training centers. Many units are afforded the use of radar equipment on board ships assigned to the Naval Reserve and full training is received on board ship on the annual two weeks' training duty.

A limited number of officers, either graduates of the wartime Navy (M.I.T.) radar school or those classified as electronics engineers (T), can request their annual 14 days' training duty at the Naval School of Electronics Engineering, M.I.T. in Boston.

Naval Reserve radiomen operating some of the electronics gear at Seattle.

The abbreviated course is designed to keep the officers informed on the latest developments in electronics and related fields such as nuclear physics.

Another training device which simulates actual conditions is the "attack teacher" designed for the instruction of anti-submarine warfare personnel. Instruments operated by sonarmen detect a simulated target and plot the data necessary for countermeasures.

A total of 25 of these instruments will be located in armories throughout the nation, according to present plans. Several already are installed and in use by anti-submarine Reserve personnel.

Training in the technical branch of the electronic warfare program begins with high school mathematics and physics, continuing through advanced mathematics, elementary physics and radio principles, and includes familiarization training with electronics equipment.

In the advanced stages, higher mathematics and principles of electronics as applied to modern equipment are the subjects studied.

The communications portion of the electronic warfare program includes a comprehensive network of some hundreds of Naval Reserve radio stations throughout the nation, Hawaii and Alaska linking naval districts with Radio Washington.

Within each district, the armory, company and platoon stations link with the district Reserve radio station.

Reserve Network

The network ties in with amateur radio emergency systems and serves as an alternate to the Naval Communication System in event of extensive casualty to any NCS facility.

Another function of the network is to maintain equipment in operating condition to help meet the needs of the Navy in the event of mobilization.

Radio traffic originated by and addressed to Naval Reserve activities is kept wholly within the Naval Reserve network.

Naval Reserve call signs established by the Joint Chiefs of Staff are assigned by district commandants on the authority of the Chief of Naval Operations. In addition each Naval Reserve radio station is issued an amateur radio call sign by the Federal Communications Commission. Some 300 of these are of distinctive letter combinations including W1USN, W2USN, etc., K1USN, K2USN, etc., K1NR, K1NRA, K1NRB, etc., K2NR, K2NRA, K2NRB, etc., and KL7NR, KH6NR.

The Naval Reserve is ready and willing when a local emergency arises.

Close liaison is maintained with the Institute of Radio Engineers, an organization comprising some 20,000 top United States radio and electronic scientists. Dr. W. R. G. Baker, vice president of General Electric, is president of the IRE.

Another civilian group with which the Naval Reserve electronic warfare program closely cooperates is the American Radio Relay League, a parent organization for close to 100,000 amateur radio operators in this country.

Electronic warfare training in each of the districts may vary with the amount of equipment and other facilities available. For example, in the 1st ND communications drills are held every night of the week except Friday and Saturday. More than half of the 10 companies and two platoons in the district use the facilities of Naval Reserve armories, while the remainder have been granted space in fire and police stations, public schools, radio clubs or various civic organization buildings.

In the Naval Reserve Training Center in Boston, Reservists use the facilities of a radio station equipped with TBL and TDE transmitters and several TCSs. A large code practice room can seat 50 radiomen strikers at one time for teaching code by hand tape transmissions, recordings or actual operation of receivers.

The facilities of the Naval School for Radarmen and the CIC Group Training Center in Boston are being used for Reserve training. Officers supplement the practical training by giving classroom instruction in theory and fundamentals.

The 3d Naval District has a quota of 90 volunteer electronic warfare companies and 350 volunteer electronic warfare platoons in addition to electronic warfare personnel being trained with organized divisions.

The extensive electronic training facilities in the New York naval shipyard used by fleet units during the war have recently been turned over to the Naval Reserve for the training of electronic warfare personnel in the metropolitan area.

These facilities include the radio operators school, loran school, radar materiel school, radar operators school, CIC school and sonar trainers. The entire installation represents one of the most outstanding all-around electronics training facilities available in the Navy.

The equipment includes complete installations of electronics equipment of practically all types used generally throughout the fleet. Late information on new developments from the Shipyard Electronics Laboratory is provided for personnel in the area.

Reservists' Mobile Unit

A mobile radio unit, the SCR-299, was recently alloted to 3d ND Reservists for training purposes as well as for a standby unit in the event of a communication casualty in the general area. Four volunteer electronic warfare companies are using the facilities of the Naval Reserve Training Center and operate the Master

Control Radio Station every Monday through Thursday.

The Potomac River Naval Command has three electronic warfare companies, two composed entirely of officers and one of enlisted personnel.

Electronic warfare company W-2, activated in December, 1946, is composed of Naval Reserve officers with technical classifications who are now employees of the Navy Department. A library committee was set up to advise on the type of publications and their sources available in and outside the Navy. Personnel will gain a knowledge of tactical and operational considerations through the study of fleet doctrines and operational requirements.

In the 5th Naval District, special consideration is given to the frequency of floods along the Ohio River section of the district. An extensive liaison program between Reserve stations and amateur operators has been set up for quick action in case of emergency.

Armories Fully Equipped

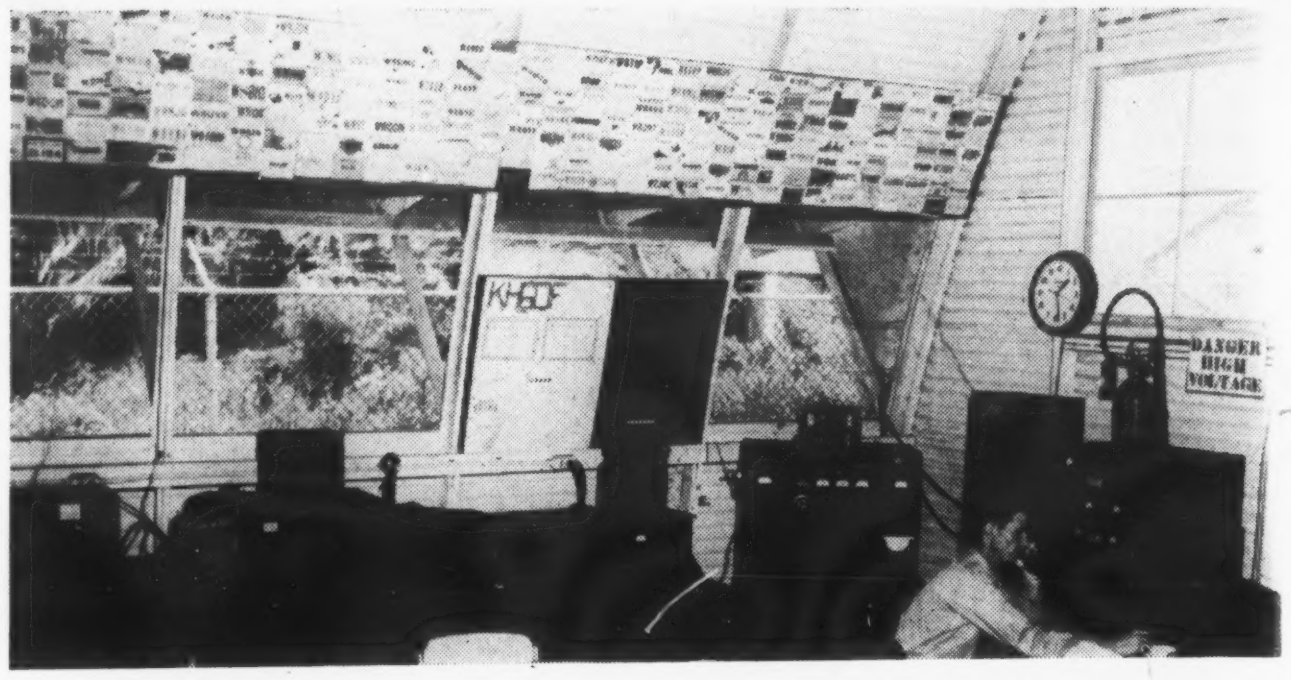
Material valued at more than a million dollars is installed in the new Naval Reserve armory at the naval ordnance plant, Macon, Ga., for the use of Reserve units in the 6th ND. Two other armories have received their full allotment of equipment, and electronics gear for armories still building is expected to arrive by the time of completion.

The communication plan for the 8th ND divides the area command into two separate networks. The eastern circuit is manned each Tuesday and the western circuit each Thursday evening. Drills are conducted by the District Reserve operational communication officer through the district and alternate stations of the district. In addition to the scheduled drills, the district station stands guard on the control frequency each Monday, Wednesday and Friday evening for contact with any Reserve radio station.

More than 100 amateurs residing in the 8th ND who are not members of any military organization, have pledged their cooperation in case of an emergency.

The 9th ND will have more than 85 stations when the first phase of the organization of the district network is completed. Throughout the district, many Reservists in the electronic warfare companies hold important civilian positions in local radio and television stations.

Many colleges and universities have provided space for these Reserve units, and the first electronic warfare company was organized at the junior college in Bismarck, N. D.



"Ham" radio station at Pearl Harbor constructed by Naval electronics instructors.

The installation of equipment at the Michigan City, Ind., training center was the first to be slated, and its SO-8 radar installation, unique in its design, was engineered by active duty station keepers, along with other electronic equipment. The Michigan City plan forms an example for the installation of equipment throughout the district.

Portable communications equipment consisting of several SCR-399s have been stationed throughout the district and will be operated according to disaster plans in case of failure of regular communications channels.

Reservists of the 11th ND have invited members of the Institute of Radio Engineers to meet with them in the San Diego armory once a month and radio clubs have been contacted for the establishment of field representatives.

The 12th ND has established a Naval Reserve radio network consisting of two operating circuits and a district Fox schedule.

In addition to the Reserve units ashore, personnel on board four vessels of the Organized Reserve participate in radio drills. Fresno, Calif., activated the first 12th ND Volunteer electronic warfare company and many others have been established since.

Professors from the University of California have presented a number of lectures on nuclear physics to electronic warfare Reserve units in the San Francisco-Oakland area, while personnel of units at Fresno State College, Stanford University, and Modesto junior college receive periodic electronics demonstrations and lectures in the college laboratories.

In addition to the several mobile radio stations to be apportioned to armories throughout the 13th ND, smaller units will have light equipment which may be readily transported to the scene of any emergency which arises. During the organizational phase, electronics training dealt primarily with communications, since that type of equipment was the first to be installed.

Electronic warfare company 14-1 was organized in the 14th ND in early November, 1946, and weekly meetings are now being held in the Naval Reserve armory, a former net and boom building with an overhead crane which has proved useful in moving heavy transmitters.

A fine library of technical books, instruction courses and other literature has been established and has reached nearly the size of a regular shipyard electronics library. The laboratory has bench space to accommodate forty men and is wired with jacks for code practice for radiomen and with suitable power for electronics work.

Plans are underway to establish electronics units on all of the major islands in the Hawaiian group, and an inter-island network will provide communications during a disaster.

Authority has been granted to set up three Naval Reserve, electronic warfare platoon radio stations in the 17th ND, Alaska, and these stations will form a valuable link with the Hawaiian Islands and the mainland.

Throughout the nation, electronic warfare Reservists train with the full knowledge that theirs is a fast-moving, highly progressive program. By keeping abreast of new developments while maintaining their own proficiencies, they help protect the future of their country.

RADAR APPROACH CONTROL

By Capt. Henry F. X. Hession and Thompson J. Simpson

The chief fault with the aircraft electronic navigational aids in general use today is that they do not provide the pilot, nor the controller on the ground, with a continuous precise picture of the relationship between the positions, courses, and speed of all aircraft operating in the same vicinity.

While the pilot may in instrument weather conditions navigate to a congested area by means of such electronic aids as ranges, homers, radio compass, and the like. there is a limit to the number of aircraft which can safely use present day electronic landing aids simultaneously.

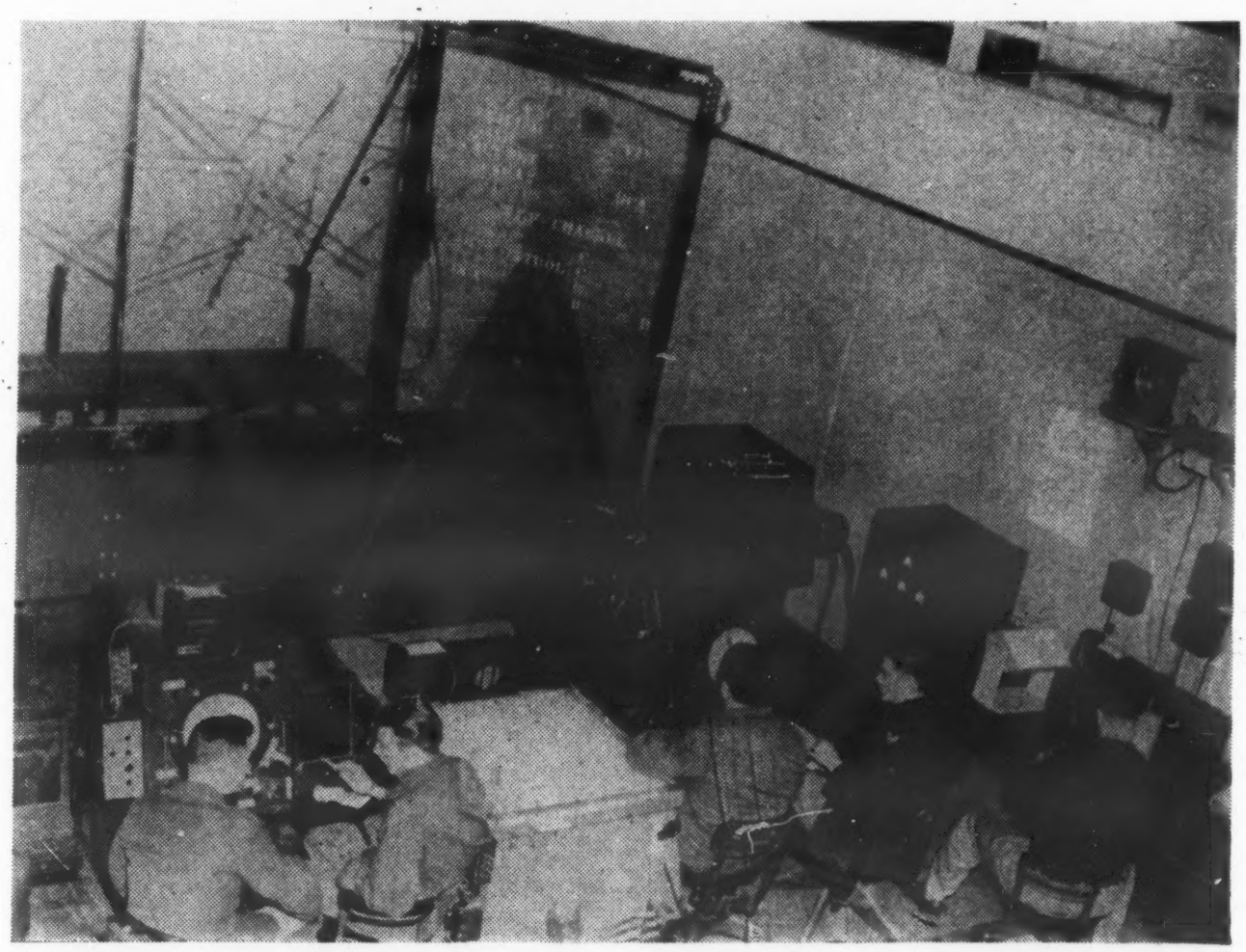
In order to operate large numbers of aircraft in all weather conditions there must be a new method of sequence of approach at congested air terminals, so that aircraft may be fed to the various types of precision landing systems in use—MPN-1, CPN-4, and ILS. Radar was seen to be potentially capable of providing the continuous picture essential to an orderly approach, but it was necessary to build a machine which could locate all aircraft operating in an area of extreme congestion—an area which might be of 45 to 50 miles in radius, and extend to an altitude of 8 or 9 thousand feet. The answer to this pressing need for an efficient medium range radar surveillance system capable of handling the high air traffic densities prevalent at the modern air terminal, civilian or military, is the CPN-18 (Cargo Pulsed Navigation No. 18) developed by the Air Materiel Command.

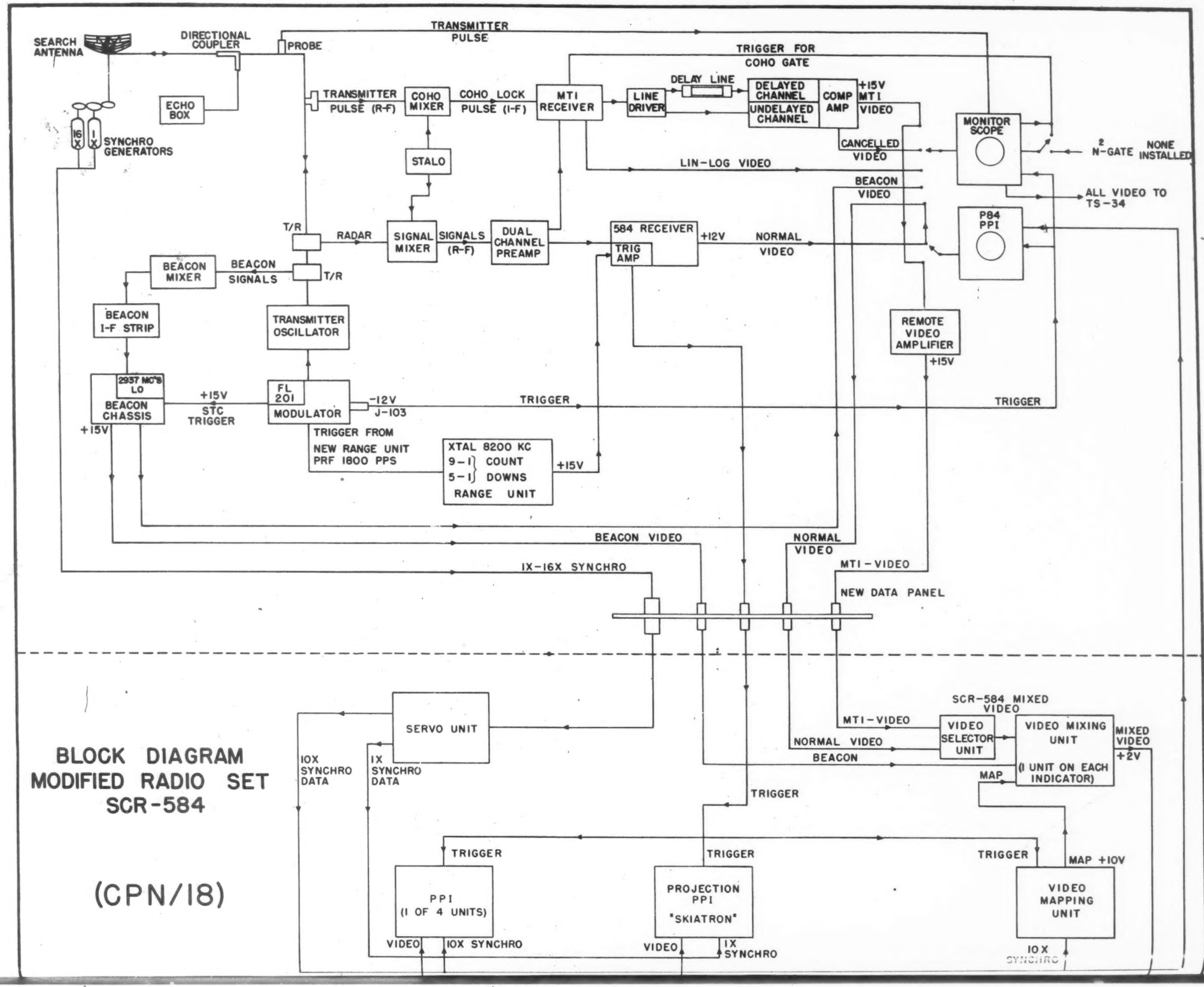
Development of the CPN-18

Initially it was determined that a radar with a relatively high pulse recurrence frequency and high peak power output would be required in order to locate targets with a small reflective surface moving at high rates of speed (such as a jet fighter). Since it would be more economical, if possible, to start with an existing radar which roughly met the requirements, and could by suitable modifications be altered to perform the desired function, the SCR-584 which was in the desired pulse recurrence frequency and power output ranges was selected. The SCR-584 is a 10-centimeter fire control radar with manual positioning and automatic tracking in azimuth and elevation, and aided tracking in range. The transmitter frequency is 2,700 to 2,900 megacycles per second. It operates at a pulse recurrence frequency of 1,707 pulses per second. RF peak power output is 300 kw developing 0.24 joules of energy at peak. The pulse length is 0.8 microseconds. Normal SCR-584 presentation utilizes two 3-inch J-type scopes.

In modifying the SCR-584 search and track radar units into a surveillance radar capable of air traffic control, many interesting and radical changes were made. The conical antenna and automatic tracking circuits were removed. A split orange peel cosecant-squared type antenna, with a triple horn feed, rotating through 360 degrees of azimuth was installed. The J-type scopes were removed, and provision made for remoting the video signal to a separate operating installation. The SCR-584 trailer had its wheels removed and was mounted atop a 50 foot steel tower. The pulse recurrence frequen-

Control room, Andrews AFB. The square topped object between the two control teams is the projection PPI, or "Skiatron."





BLOCK DIAGRAM MODIFIED RADIO SET SCR-584

(CPN/18)

y was increased to 1,800 pulses per second and the frequency to 3,000 megacycles per second. The pulse width remained at 0.8 microseconds, while peak power was set at 240 kilowatts.

The video signal was remoted to four standard 12 inch PPI indicators and a projection PPI, the latter giving an image screen 36 inches in diameter. The chief feature of the projection PPI system, in addition to the greatly increased size of the resulting image was the persistency of the radar echo traces, obtained by the potassium iodide coating on the cathode ray screen. Coatings with a zinc sulphide or zinc salycitate base are normally used in cathode ray tubes. A video mapping head, using one PPI console, provides video mapping for the control scopes. This mapping contains an overlay of the ranges, fan markers, airports, major obstructions, runway extensions, etc., which appears on the control PPI scopes as a superimposed electronic map without affecting the radar echo blip appearing as a result of aircraft detection.

In addition, a moving target indication (MTI) component is provided. This component receives the incoming signal and stores it in a delay tube until the next signal is received.

The beat note (against a reference frequency) of the first signal is then compared with the second and if there is no change in amplitude (which could be caused by motion) the signal is automatically cancelled. This system uses the well known Doppler principle, that the return from a moving target has a frequency which is different from the transmitted frequency. The relationship for this is given:

$$f = \left(\frac{v + c}{v - c}\right) f_t$$

Where f is the frequency of the radar return, v is the velocity of the target. c is the velocity of the transmitted wave and f_t is the transmitted frequency. It can be thus readily seen that with no velocity (or motion) of the target $f = f_t$. The MTI system subtracts the signals of the first pulse return, beat against a reference frequency, from those of the second pulse, beat against the same reference. Those signals which have an amplitude difference by reason of differing beat notes (because of frequency shift due to Doppler effect of motion) are the only ones which appear in the output, and other signals are eliminated. Thus, if there is no motion there is no frequency shift, the beat of the return frequency against the reference is identical, the signals cancel, and stationary targets do not appear in the controllers' scopes. This is a decided advantage.

Installed at the control position of the CPN-18 are remoted controls for either HF or VHF ground/air communications in addition to appropriate interphones and teletalks as required to accomplish coordination with interested ground agencies.

Potential Of CPN-18 Seen

After initial tests by experts of Air Materiel Command at Clinton County Ohio, it was decided to give CPN-18 equipment a thorough operational test in connection with the All Weather Flying Program currently being conducted by the United States Air Force. Accordingly a CPN-18 equipment was installed at Andrews Air Force Base, Maryland (just outside of Washington). In March 1947 the CPN-18 at Andrews was manned by a small number of Airways and Air Communications Service (AACS) personnel who placed the facility on an eight hour a day operating basis, providing control for All Weather Flights, and observing and obtaining operational data. For the next few months many minor modifications were made in the equipment, designed to improve its operating efficiency. During this same period the controllers were tantalized by the pictures of Washington air traffic appearing in their scopes and realized more fully the tremendous possibilities of the CPN-18 as a means of increasing the safety and speed with which air traffic could be landed during periods of instrument flying weather. Various experiments were conducted by them to determine exact operational limitations of the surveillance radar equipment obtained from the SCR-584 beginning. It was found that an area of approximately 43 nautical miles was scanned to an altitude of 6 thousand feet. Within this area, all aircraft, even small fast fighters were detected and clearly portrayed in the CPN-18 scopes.

There are three main spheres of air traffic control which lend themselves to radar usages; the air route or area problem, the congested terminal problem, and the landing problem. Tackling the problem from the ground up, the first radar device developed as a positive voice control system for aircraft was the now famous ground controlled approach (GCA) which contained a short range (25 miles) search radar, and a precision radar system beamed down the approach end of the runway providing continuous azimuth and elevation information to a ground operator who in turn was able to instruct the pilot as to his position right or left of the runway, or above or below the ideal approach glide path in such a way as to insure highly accurate landings even under the most adverse weather conditions. Beyond providing a means of bringing aircraft down in the worst weather conditions, GCA alone was of little help in enabling the movement of great numbers of aircraft in the worst of weather conditions. This was because the average time for a GCA approach was in the neighborhood of 15 minutes, or four aircraft per hour. Its traffic control capabilities are limited to the area in the immediate vicinity of the field.

Terminal Area Control

The CPN-18 is the first attempt to achieve positive control of the terminal area, within which inbound aircraft must maneuver prior to engaging the actual landing device (MPN-1, CPN-4, or ILS). With positive control, aircraft could be properly spaced, and directed into the landing device, at much higher hourly rates, and at several different airfields, if necessary. With APES (Approach Electronic Systems) such as CPN-18 in use, the search systems of the GCA units in the surveillance area of CPN-18 are turned off. Both CPN-18 and GCA search operate in the S band (10 cm) frequency spectrum, and characteristic spiral spoking interference is obtained in CPN-18 scopes from GCA operation. While annoying, the intensity of interference varies with the distance between the GCA and CPN-18 units and even under very adverse conditions of closeness simultaneous operation of CPN-18 and GCA search system is possible. The GCA precision system is designed for operation on X band (3 cm) and so does not interfere with CPN-18.

The final runway approach of an aircraft in visual weather averages from 2 to 5 miles in length, depending on the size and speed of the aircraft. A GCA approach averages from 6 to 10 miles in length, the slightly longer distance being required to align aircraft properly (establish proper crab, if crosswind exists). At an average indicated airspeed of 120 mph on approach (2 miles per minute) the GCA precision approach varies in length from 3½ to 5 minutes, whereas the full GCA approach requires 8 to 19 minutes in

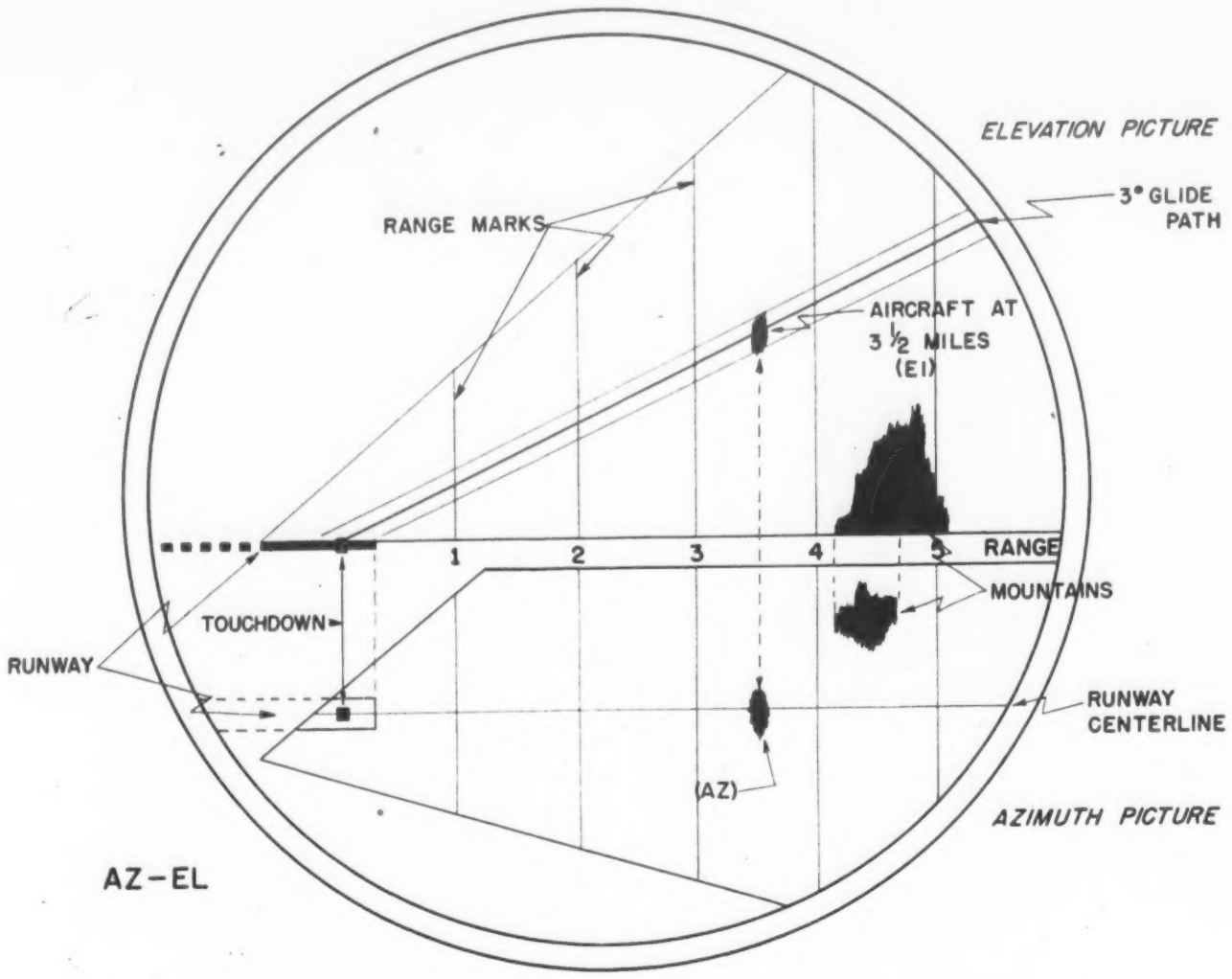


Figure 1.

the search system (picking the aircraft out, steering it around from the radio range station or other conventional radio navigational aid placing it in position 8 to 10 miles off the end of the approach runway) plus the time required for precision approach for a total of 13 to 15 minutes per aircraft. It can be seen that the precision system (using but one voice communications channel as explained later) can handle, theoretically, one aircraft every 5 minutes or so provided aircraft arrive in the proper position at the proper time. It is the job of CPN-18 to establish the proper spacing of aircraft, and to vector them in such a way as to have them arrive at the landing aid pickup point as fast as the landing aid can absorb planes. CPN-18 also monitors the movement of non-controlled traffic in its area of scan, and directs planes under its control so as to prevent mid air collision.

Channels Limitations

VHF communications, because of line of sight propagation, freedom from static, and ease of use are the preferred voice communications medium. HF voice frequencies are also used even though they are not satisfactory in bad weather when they are needed most, because of the enormous frequency congestion on VHF frequencies allocated to navigational aids and routine ground to air communications. The typical Air Force VHF frequency crystallization, for aircraft which are equipped with the new 8 channel VHF set (AN/ARC-3), is as follows:

Channel	Frequency	Service
A	116.1 mcs	CAA Airways (Ranges)
B	126.18	Air Force Control Towers
C	137.88	AACS Airways (Plan 62) GCA search (secondary)
D	140.58	Emergency
E	Varies	Organizational Frequencies
F	Varies	Organizational Frequencies
G	137.70	GCA Search Control
H	134.10	GCA Final Approach

It can be seen that but three VHF channels, C, G, and H were allocated to Radar Control and GCA. But due to the volume of traffic on C channel because of contacts with the AACS Plan 62 airways stations (SIGNALS, Nov-Dec 1947, "USAF Flight Communications"), that channel is not available in the majority of instances. Thus but two usable VHF channels are available to US Air Force traffic control radars, channel G on 137.70 mcs and channel H on 134.10 mcs. This is a major limiting factor on the efficiency of radar air traffic control devices at this time.

The ideal arrangement would have two VHF channels for the search controllers and four VHF channels for 4 final controllers. With that number of voice channels an experienced crew could land aircraft at rates approaching one a minute in instrument weather using radar equipments and techniques now developed.

This is a revolutionary statement but one which has been demonstrated by the experience of the CPN-18 unit established at Andrews Air Force Base, Maryland. The functions of a CPN-18 unit are broken down into two rough categories: the task of detecting aircraft echoes, of identifying the echoes with particular aircraft, and vectoring them into the traffic pattern; and the task of establishing proper space relationships within the pattern and vectoring the aircraft to the point where the precision controller can take over for final landing. Theoretically, the task of sorting and identifying a large number of aircraft flying different courses and altitudes would be fantastically complex; but in actual instrument weather conditions the theoretical initial chaos does not obtain, since aircraft flow into the terminal area already separated by very large time margins according to CAA IFR standards. As the system is now functioning, aircraft proceeding to Andrews AFB are detected as soon as they break from the usual welter of traffic holding south of the Washington radio range and begin to proceed to Brandywine radio range, southeast of Washington. CAA relinquishes control to CPN-18, and identification is positive when the aircraft reports over Brandywine radio range (while its echo is observed in a corresponding spot on the radar scope), and instructions are immediately issued by Andrews CPN-18 vectoring the aircraft toward a landing. There has not been a stack (a group of aircraft holding over a navigational aid waiting their turn to land) for Andrews since CPN-18 went into full operation on 8 March 1948.

GCA Has Saturation Point

In spite of the recognition given GCA when the Collier Award Committee stated in December 1946 that GCA was "the greatest achievement in Aviation in America" (SIGNALS, March-April 1947 "Eye in the Sky"), CPN-18 has proven that air traffic can be marshalled and spaced and fed to the GCA precision system faster than present GCA systems can absorb traffic. One GCA difficulty is due to the aforementioned lack of clear VHF communications channels. Another is due to the design of GCA equipment now in use.

Unfortunately, the present GCA saturation point is governed more by existing equipment designs than by personnel limitations. This is excusable since terminal landing equipments now in use are those employed during the recent war and are unchanged in basic designs. Modifications have been made which have im-

proved their operational characteristics, but the full value of the radar landing aid in air traffic control is yet to be realized.

The original war grown GCA employed three people (out of a standard crew of 24 men) in the specific job of directing one aircraft to a safe landing during inclement weather. No other aircraft could be accepted on the "approach leg" until these three men had fulfilled their responsibility to the first aircraft. It was realized even then that the time between aircraft could be materially shortened if the GCA precision information was presented so that a single operator could assemble and transmit the required landing instructions. Heretofore, two operators were required in order to track individually information concerning the aircraft's range, elevation, and azimuth with respect to established references. The third operator, the final controller, interpreted and relayed this data observed from meters activated by controls from the two scope tracking cursors to the pilot in verbal form that would permit the latter to follow the issued instructions.

No "Divided Attention"

The obvious answer to personnel economy was a single cathode ray tube display. Several half-way measures were tried, involving one operator and two tubes; unfortunately they fell short of providing the desired result. Not until the development of the AZ-EL scope by Gilfillan had any marked improvement of scope presentation been provided and the goal more nearly reached. Although not in general use at the moment (it is incorporated in the new CPN-4 development program) the AZ-EL presentation is gaining favor among radar controllers having had the opportunity to use this type of tube presentation.

The AZ-EL type of presentation displays on the same cathode ray tube screen, the picture information that was originally presented by four separate tubes. (See figure 1) The four tube method, obviously, involved quite a bit of eye movement on the part of the two operators in order to observe the individual information shown. When an attempt was made to have one operator evaluate the information contained on only two tubes, it was found that he suffered from a psychological factor that caused him to "over-control" on one or the other of the tubes. In words of the layman, he simply concentrated too much, for example, on keeping the aircraft on the proper glide angle while meantime the aircraft was drifting off course in azimuth. This factor has been unofficially given the name "divided attention" and is due, primarily, to the physical separation of the cathode ray pictures.

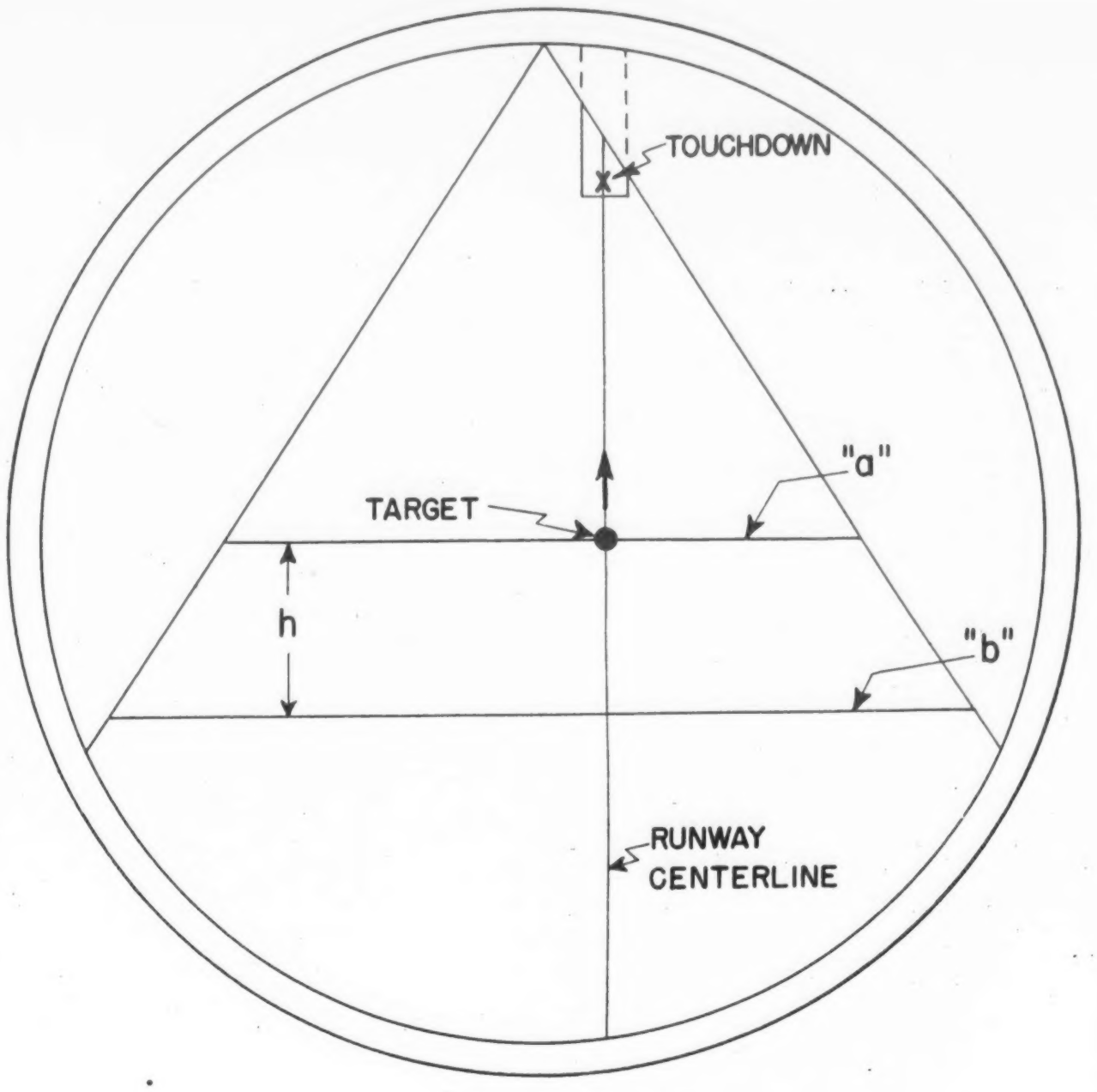


Figure 2.

The AZ-EL tube largely dispenses with "divided attention" since the azimuth and elevation pictures are now placed on one tube screen in two located displays.

Another proposal that is being considered by the Air Force is the display depicted in Figure 2. Here the two pictures of the AZ-EL scope are combined into a single display. The azimuth picture is displayed in the normal manner and azimuth deviations are indicated by a departure of the target with respect to the vertical line which represents the runway centerline extended. As shown, the target is "on course."

Elevation information, on the other hand, is provided by the horizontal electronic marker "a" which shows the deviations of the aircraft with respect to a predetermined glide path. As shown, the target is on the glide path. If this condition obtains down to touch down, the line "a" will track and continuously intersect the target. If the aircraft drops below the glide path, this line will lead the target and vice versa. Height above the ground is portrayed by a second marker "b" which follows the target so that the distance between the target and "b" decreases with decreasing altitude of the aircraft. At touch down, after completing an ideal approach, "b" becomes coincident with the target and "a." It will be observed that all necessary information, "right or left of runway," and "above or below glide path," is confined to one relatively small visual field, i.e., the target. This should eliminate the factor of divided attention. The Watson Laboratories of the Air Force Air Materiel Command are presently developing an experimental model to test its operational characteristics.

50 Second Landings

Given a suitable single tube display, be what it may, one operator can successfully control one aircraft from initial pick up to touch down provided one operator-per-aircraft-per-tube-per-communications channel is responsible for one aircraft. Unlike the present GCA operations where only one aircraft is permitted on the approach leg at any one time, several can be handled simultaneously so that more efficient use may be made of the final approach leg. The ultimate goal is the landing of aircraft at normal runway traffic absorp-

tion rates. In recent trials of a similar system at Barksdale Air Force Base, Louisiana, 36 aircraft were landed in one hour and ten minutes. In addition a radar tactical approach procedure was drawn up and tested and aircraft were landed at 50 second intervals under simulated instrument conditions.

Three-In-One Handling

From the foregoing, a working axiom for an efficient and expeditious radar approach and landing system may be derived. The normal runway absorption rate, under visual flight conditions and based on the performance characteristics of the type aircraft normally using the field, should be calculated. Assuming that a figure of 50 seconds is obtained for the time required to land from the time the aircraft passes over the field boundary until it turns off the active runway, if a safety factor of 0.5 or more is applied, the end result will be a runway absorption rate of a plane every 1½ minutes or thereabouts.

Since a plane may safely land every 1½ minutes, aircraft flying at 120 mph must be spaced not closer than three miles apart on final approach (and in the traffic pattern). This would mean, on a 10 mile final approach leg, that three aircraft would be handled simultaneously on final approach, by three controllers, using three separate radar scopes and three clear VHF voice communications channels: 1 scope, 1 controller and 1 clear VHF channel required per aircraft on final.

It is noted that this radar system is not a future technique, but is possible right now with equipment already developed and in use. In the not too distant future the axiom may be restated somewhat by the use of automatic GCA landing devices. In this case, the radar signals are interpreted electronically and transmitted to the aircraft (which must carry appropriate airborne equipment) in the form of tone modulated signals. There are three types of data which must be transmitted: elevation data, lateral position data (azimuth), and throttle control data (thrust) and this means three data carrying frequencies per aircraft. It is immediately apparent that automatic radar landings are prohibitively expensive in frequency utilization when applied to large air traffic volumes. Development of the automatic GCA is in actual progress at this time under the aegis of Air Materiel Command (Watson Laboratories) working with Gilfillan Bros. Inc., the manufacturers of existing GCA equipments (the AN/MPN-1 and its successor, the AN/CPN-4).

The ideal solution, of course, is a projection of the ground scope images to the pilot by means of a television system. Thus, the pilot would have the same image of his position as the ground controller, and would approach and land without the need for voice communications. This, too, is actually in the process of development by RCA under the name of Teleran.

Vast System Being Planned

On 17 February 1948, the Radio Technical Commission for Aeronautics published an exhaustive survey of the best thought extant in the field. This report, entitled the Special Committee SC-31 Report, which has been approved by every major aeronautical agency in the United States, makes sweeping recommendations in the whole field of aeronautical operation: governmental and private, military and commercial. Assuming the existence of 100,000 properly equipped aircraft in 1960, the SC-31 committee proposes to spend 1,112.8 *millions of dollars* to implement a successful integrated air traffic control system by that time. Since the Air Coordinating Committee, the Congressional Aviation Policy Board and the Research and Development Board concur in the proposed program, it is very likely that the necessary legislative action to support the program will be forthcoming from the next Congress.

SC-31 proposes the installation of 50 General Control area offices, 550 Airport Control area offices, and 550 enroute stations. The General Control area offices will have automatic flight path planning and flow control equipment, airport time utilization equipment, and a general planning display system. The Airport Control area offices will be lavishly equipped with various radar devices and automatic aids, to control and monitor all landings and takeoffs and equipment moving on the airport surface. An enroute station will have a surveillance radar, traffic separation electronics equipment, and Nav-Aid equipment. The whole system will be interconnected by a maze of interphone and teletype equipment. It is expected that the cost of renting this communications net alone will be $7,523,280 annually by 1953.

The plans of SC-31 are mentioned to give some inkling of the enormity of the problem of air traffic control. Today, the major limiting factors to

CPN-18 tower with modified SCR 584 on top.

airline development are inadequate and antiquated air traffic control systems and techniques. The major features of the SC-31 program are scheduled to appear between 1958 and 1960. As an interim measure the use of VHF ranges and DME (distance measuring equipment) are proposed as a crutch to our very obsolescent present radio range system. The life of DME equipment is proposed at 10 years from 1952 to 1962. But surveillance radar equipment is also proposed for installation during the same period as a secondary system! Military requirements being what they are, the military agencies informally favor radar techniques. First, they exist now; second, they handle all the traffic which can be put in the air at this time; and last they can be operated from one centralized point.

With GCA (MPN-1 and CPN-4) for landings, and CPN-18 for terminal control two of the immediate air traffic control problems are met, and successfully, right now. The last problem, that of area control, is now being attacked by the U. S. Air Force, once again from the standpoint of basic radar techniques now in existence. A long range radar of the MEW type is being modified and changed into a central control station that promises to be CPN-18's big brother.

It is not possible to predict the ultimate growth of the radar program in air traffic control insofar as types of equipment that may be used. It is enough to say that the US Air Force has recently contracted for 20 CPN-18 radar approach control equipments to emphasize the importance and present success of radar approach control.

SC RESEARCH PROGRAM

By Harold A. Zahl

Signal Corps Engineering Laboratories, Fort Monmouth, N. J.

In 1942, under the stress of war, long-term research was dropped from all project activities of the various Signal Corps Laboratories. All effort was turned to the problems of expedited engineering, development, production, maintenance and training; for these *directly* involved life and death for troops overseas in combat. Research during that period implied use of manpower against a post-war period or assumed a war of indefinite duration. Advance studies for the Signal Corps followed during the war, therefore, only as indirect by-products of development contracts with industry and through the efforts of the Office of Scientific Research and Development.

The wisdom of the military decision in thus restricting research, while questioned by some, is supported, nevertheless, in that victory came sooner than generally expected and each day less of conflict meant more living Americans.

Through experience in two major wars, it now appears as probable that should a period of conflict again arise, the "baton of research" will as before be passed to others less directly concerned with the immediate problems of battle. All plant and personnel resources built up during peace by the Signal Corps will again be thrown directly into military problems, particularly those such as quick developments to meet the unexpected situations of a fast-moving scientific war, assistance in procurement and maintenance of fantastically large quantities of complex scientific military equipments, and assistance in troop-training problems in camps and under conditions of combat.

During periods of peace, Signal Corps research policy, supported by the Chief Signal Officer, Major General Spencer B. Akin, and the Research and Development Division of the General Staff, Department of the Army is: first, to encourage advanced studies within Army laboratories; and second, in accordance with budget allocations, to maintain research projects related to military interests in educational institutions and in industry.

More than two and one-half years have now passed since the cessation of hostilities, and the peace-time program of the Signal Corps has taken rather definite shape. Development work still remains the primary and major task of the laboratories, but it has been possible to divert a considerable portion of available personnel and facilities towards basic and applied research projects related to the military effort.

Physically, the Signal Corps Engineering Laboratories are divided into three parts, all in Monmouth County, New Jersey: Squier Signal Laboratory, Fort Monmouth; Evans Signal Laboratory, Belmar; and Coles Signal Laboratory, Red Bank. A total personnel of approximately 2,000 individuals are divided among the three laboratories for all activities.

Research Policy

Before considering the program, a few words on Signal Corps research policy may be of interest.

a. National defense is the primary consideration as reflected through equipping the Armed Services with the best possible equipment of the type for which the Signal Corps is assigned responsibility.

b. Research on specific problems is not undertaken or financially supported if the same work is already being done with acceptable expenditure of effort by educational institutions, or industry, or some other governmental agency.

c. Internal research in most cases is kept closely allied to the current development program.

Many readers will undoubtedly raise the question as to whether research would not flourish better when not too closely allied with development. Surely, the answer for basic research must be in the affirmative, but a military laboratory can hardly operate with disregard of practical problems for the following reasons:

a. The time interval between "discovery" and application must be kept to a minimum.

b. The sheer magnitude of many projects requires facilities and personnel far beyond the scope of any self-centered research group, as for instance, research dealing with the upper atmosphere may require simultaneous employment of rockets, radar, communications, visual tracking, sound ranging, aircraft, etc.

c. The scope of Signal Corps interest and responsibilities is so broad that within limited budget and personnel ceilings, it is usually necessary that the same personnel participate actively both in the research and development aspects of projects.

Program

General Aspects. Readers acquainted with the difficulty of classifying research in Science Abstracts, Government fiscal procedures, etc., will understand the reasons for sub-dividing the research program according to the organizational structure of the laboratories based upon applications, rather than on physical definitions. However, within this structure, research is underway in the field of magnetism and electricity, electron ballistics, circuitry, elementary particles and their interactions, particle accelerators, solid state, properties of matter, deterioration prevention, electrochemistry, thermochemistry, polymers, mechanics, applied mathematics, computing devices, atmospheric physics, propagation, radiation and heat, acoustics, power systems, biophysics, and others.

Communications in a broad sense is the Signal Corps' major activity. Experience of the last war pointed out the need for more and more integration of communications systems. The fast moving action of large military groups will involve coordination in the air, and on the ground, together with the frequent addition of supporting naval units thus requiring a flexible system which will permit the interconnection of wire, radio and

To test equipment in Arctic temperatures Signal Corps engineers create sub zero weather indoors at Fort Monmouth.

optical circuits to the maximum extent possible and with the provision of a large number of voice, facsimile, telegraph and even television circuits for high-speed communications and transmission of data. Accordingly, in planning the Signal Corps' research program, major emphasis has been directed into fields leading toward information which will help in solving the many complex problems vital for successful communications in war time.

In planning such a research program, it was known from the beginning that a basic program for communications alone could hardly exist, since the requirements of radar, sound and light ranging, meteorology, and other fields were frequently synonymous. For example, knowledge of electromagnetic propagation. which is vital in communications and radar, serves the meteorologist in the sense that limiting factors in effect, provide the methods for making measurements on atmospheric phenomena most essential in explaining, predicting, and perhaps, in the future even controlling the weather.

With these introductory remarks, in the sections following, a few high spots in some of the major fields will be touched upon. Time will not permit any degree of completeness in the discussion of the program and specific references, therefore, are to be considered as representative of, but not portraying the full scope of activity.

Electron Tubes. Perhaps no single field of research in the physical sciences has more fundamental importance to Signal Corps problems than studies of electronic phenomena, since the application of such knowledge may open the way for solution of military problems thus far unsolvable. In fact, the history of communications and radar is in essence that of the electron tube. Accordingly, considerable research in this field is conducted within the Signal Corps Engineering Laboratories which is augmented greatly through support given to industrial concerns and academic institutions for basic studies of particular military promise.

For example, at Columbia's Radiation Laboratory, Rabi and his coworkers are doing work on microwaves started under the NDRC during the war, stressing research leading towards a better solution of generation and detection of millimeter waves. It is of interest to note that this work recently led to an important by-product in pure physics in which, following the brilliant experiments of Lamb and Retherford, a small but most significant discrepancy between the Dirac theory of the hydrogen atom and experimental observation was revealed through use of microwave techniques.

Related to the Columbia activities is the electron tube program with the General Electric Company, also started by the NDRC and which has been continued under Hull, Wilbur and Nelson. In this program, major emphasis is being directed toward a better understanding of the theory and fundamental electronic problems of continuous wave magnetrons.

At Purdue, Lark-Horovitz and his staff are pressing forward in the field of semi-conductors such as germanium. In this work, it has also been possible to predict theoretically the transition from behavior explained by classical mechanics to behavior requiring quantum mechanics for their explanation and then to check the predictions of the theory quantitatively by comparison with experiments. From a practical point of view, the experiments are leading the way toward greatly improved crystal rectifiers for use in radio and radar circuits.

Among the internal basic research projects underway are studies of gas spectra under pulsed conditions and the initiation of oscillations in magnetrons. Of interest also is the production of intense hollow electron beams using suitably modified cylindrical anode magnetrons. Because secondary phenomena are basic in many cathode ray and storage tubes, fundamental work is under way on investigation of the secondary emission curves of many hitherto unmeasured semi-conducting materials, including phosphors.

In addition to that named, important work in electron physics is underway at Massachusetts Institute of Technology, Harvard, Michigan, and Stanford. Also, almost every major electronic industrial facility is contractually involved in the extension of knowledge in this field through development activity.

Materials Research

Materials. The improvement of the presently available materials used in the construction of electronic and other equipments is a requirement for meeting the demands of higher frequency and power operating under extreme climatic conditions. Since it must be assumed that future military operations may be conducted in any climate between tropic and arctic, it is necessary that the materials of construction be able to withstand such conditions. Accordingly, materials research is based upon:

a. Improvement of materials considered quite suitable for civilian usages but not meeting military requirements; fields of research include plastics, ceramics, insulators, metallurgy, high-temperature films and oils, etc.

b. Research on synthesizing processes on production of critical materials such as mica, quartz, etc., which are obtained largely by import and may not be available during a future conflict.

c. Development of entirely new materials specifically for military requirements.

Among the contractual programs in this field is that at Princeton where Taylor, Tobolsky, Alyea, Willis, Rahm and Vasileff are carrying on a program intended to provide the basis for producing improved plastics, synthetic resins, flexible insulators and insulating oils; at MIT where von Hippel and his staff are carrying on basic work on dielectrics started by NDRC during the war; at Rutgers where Koenig is carrying on basic investigations toward improved ceramic materials for wide range of temperature and humidity conditions; at Battelle and at Armour where Gonser and Mahin, respectively, are looking into basic properties of alloys for improving the Army's field wire.

Quartz Supply Limited

During the war, 70,000,000 quartz crystal units were produced for frequency stabilization purposes. So critical was the use of quartz in combat communications that crystal grinding teams were sent directly to the theaters of operations. The supply of good natural quartz is very limited and, of equal significance, it is imported. Accordingly, a major effort is being directed toward finding a suitable substitute for quartz or learning how to grow quartz within the laboratory. The work of Frondel of Harvard on synthetic tourmaline structure types and that of Jaffe and Hale at Brush in synthetic growth of quartz is now showing particular promise. Among other institutions engaged in research in the field of frequency control elements may be listed Antioch College, University of Minnesota, Edward Washken, Baird Associates, Tufts College, Wesleyan University, Colorado A & M, Auburn Research Foundation, Philips Laboratories, Georgia Tech Research Institute, University of Illinois, Rutgers University, Armour Research Foundation and others. On matters of frequency stabilization, the work of Cook and Fletcher at Harvard, using an absorption line of ammonia to control a conventional microwave oscillating circuit, is of great interest for future application of microwaves.

Power Sources. The problem of satisfactory power sources, including motor and hand-driven generators, primary and secondary batteries, is most vital in all military applications of electronic equipment. Perhaps no other group of components is further from meeting the full requirements of visionary military characteristics. For example: during the recent war, the tell-tale noise of motor generators led countless enemy night patrols to communications and radar centers; light-weight communications or radar sets find much of their weight represented by power supplies, either motor-driven or battery; while in the future, effective use of radio or television relay systems in many cases implies unattended stations in remote and very inaccessible parts of the world where reliable power sources for continuous duty constitute the major problem. For this reason, it is quite natural that a significant fraction of the basic research effort be directed towards investigations involving the fundamental principles of power generation or conversion. In the field of conventional motor-driven generators, a decided step forward has already been taken in pioneering the use of permanent magnetic fields and higher frequencies for power purposes. In batteries, progress is being sought through exhaustive investigations in electrochemical combinations and factors which presently impose limiting conditions on current commercial products. Work in this latter field is proceeding at Illinois, Georgia Tech Research Institute, University of Ohio, Northwestern University, Dowl Chemical, Eagle Picher and others. Even the ancient thermoelectric method of generating power is in the picture, and a search is under way at Franklin Institute under Swann and Coleman for increasing thermoelectric efficiencies through use of new materials which appear promising in attaining the theoretically required high values of thermoelectric power, low heat conductivity and low specific resistance.

Need For Propagation Data

Propagation of Electromagnetic Waves. The limitations of present knowledge on propagation make this a particularly fertile field for further research. Perhaps the best known Signal Corps experiment in this field was that conducted by De-Witt and co-workers when in January 1946 electromagnetic waves were transmitted through the earth's atmosphere and again detected, following reflection from the moon. Activity in this particular field is now being directed toward construction of planetary equipment for selected frequency operation as the gear follows the moon in its orbit.

The current propagation program was established to investigate the propagation of radio, sonic and infrared waves through the atmosphere and earth media intended particularly in the first-named field to supplement the program of the Central Radio Propagation Laboratory of the National Bureau of Standards. Insofar as specific application to Signal Corps equipment is concerned, the opening up of the microwave spectrum has focused attention on the effects of meteorological phenomena on guidance, attenuation, reflection and refraction of radio waves. During the war, several cases of equipment development without concomitant research on propagation led to bitter endings; for example, a K-band radar device was placed on production and to the distress of all concerned, the operating frequency selected was found to coincide with a strong water vapor absorption band. It is increasingly evident that basic data relative to all types of propagation must be compiled to provide that fundamental knowledge which is essential to the design of future equipments. Because of geographic difficulties inherent to work in the field of propagation, most of this work is conducted in various Service laboratories of the Navy, Air Force and Army and at the National Bureau of Standards. Mention must, however, be made of the outstanding work in electro-magnetic propagation underway at Harvard under Mimno and Pierce, and of Schilling at Pennsylvania State in the field of supersonics.

Circuits (Communications and Radar). For reasons of security, only

Instruction on AN/TXC facsimile set at Fort Monmouth.

Channel in clouds created by seeding with solid carbon dioxide.

casual mention will be made of activities in this field. Bell Telephone Laboratories, Farnsworth, Radio Corporation of America, Westinghouse Electric and Manufacturing Company, Federal Telephone and Telegraph, and General Electric, and other industrial concerns are all pushing forward in these fields, under either research or development contracts. In academic circles, particular mention must be made of the work of Stratton and his staff at the Research Laboratory of Electronics, MIT where following the closing of the wartime Radiation Laboratory considerable basic electronic research work was initiated under the joint sponsorship of the three Services. Projects underway at MIT include: Microwave and physical electronics; microwave physics; modern electronic techniques applied to physics and engineering; communications and related projects. Similarly, following the close of the wartime Radio Research Laboratory at Cruft Laboratory, Harvard, Chaffee and members of his staff are carrying on basic work in antennas, microwave optics, microwave circuits and physical electronics, and as already mentioned, wave propagation.

Upper Atmosphere Research

Meteorology. Prior to World War II the instrumentation and techniques used in experimental meteorology were to a dangerous extent obsolete. The new techniques, especially electronic, developed by physicists and engineers during the past twenty years had not been fully exploited by the meteorologists. Lack of equipments by which to acquire definite data on the physical state of the atmosphere and on the nature of the continual and subtle changes taking place therein, resulted in serious shortcomings in forecasting techniques. Some of the limitations are mentioned to illustrate the condition. Wind velocities were required when the sky was overcast, but pilot balloon techniques were inoperative under these conditions. The trajectory of hurricanes and typhoons were needed but no equipment was available by which they could be determined. Data on the upper atmosphere at least to 75 kilometers and preferably more were needed, but no apparatus existed for this requirement. To accomplish these purposes and others, the meteorologist turned increasingly towards electronics. It is now considered that forecasting for future military operations will require an instantaneous and long-range three-dimensional presentation of data concerning winds, temperature, pressure, humidity and turbulence, all of which draw heavily on electronics and communications techniques. Today within the Signal Corps, meteorology is interwoven throughout a major portion of the research and development program.

As part of the Signal Corps upper atmosphere program, the Wac Corporal was developed by the Ordnance Department as a vehicle for carrying measuring instruments into the stratosphere. Later through the availability of German V-2's, these rockets were and are being used in many aspects of the meteorological program including measurement of atmospheric parameters to 150 kilometers and beyond through the use of specially developed temperature and pressure instruments, sound ranging techniques, smoke trails, and air sampling flasks lowered by parachute after seal-off at known altitudes. Navy-developed Aerobee rockets will be used with lighter loads when they become available. Research of this type is only possible through the cooperative efforts of various elements of the Department of the Navy, Department of the Air Force, the Army Ordnance and the Chemical Warfare Department. The V-2 Upper Atmosphere Research Panel serves to implement this cooperation, by including at the working level representatives of these various departments, as well as of participating civilian agencies. Among the latter, special mention must be made of Nichols and his coworkers at Michigan who are engaged in designing instruments and methods for use in rockets to determine pressure, temperature, wind velocity and consistency of the upper atmosphere.

Radar and Meteorology

In the field of weather control, the past eighteen months has been a period of great achievement. The techniques of Langmuir and Schaefer of the General Electric Company in seeding supercooled clouds with solid carbon dioxide and silver iodide nuclei. producing thereby condensation and precipitation, has placed this phase of the research program among the items of primary interest to the Department of National Defense as well as to other governmental agencies. No one can predict at this time where research in this field will eventually lead and to what extent application of research results will affect military warfare or civilian life.

To exploit radar possibilities in meteorology, Bemis at MIT is making radar observations simultaneously on weather disturbances and airplanes flying in and about such disturbances correlating the effect of frequency, pulse length, pulse repetition, frequency and peak power on radar echoes from cloud formations, rain or snow or other weather phenomena. Synchronous measurements are made from aircraft of water content, particle size and distribution, turbulence of the atmosphere and correlation of these items with weather radar.

In the field of sferics, which means radio direction finding on electrical disturbances in the atmosphere, work is underway at the University of Florida and the New Mexico School of Mines. The principal problem in this field is to complete the understanding of basic physical phenomena of atmospheric disturbances and to

TABLE I
JOINT SERVICE CONTRACTS

stitution	Fields of Investigation	Contract No.	Supporting Services	Remarks
esearch Lab. of Electronics, MIT	Microwaves, Electronics, Physics, Communication & associated problems.	W36-039-sc-32037	SigC AMC ONR	
ruft Laboratory, Harvard University	Electromagnetic Radiation & Wave Propagation, Microwave Circuits, Physical Electronics.	N5ori-76	ONR SigC	
lastics Laboratory, Princeton University	Plastics, Synthetic Resins, Flexible Insulations & Insulating Oils.	W36-039-sc-32011	SigC ONR	BuShips also has representation.
eneral Electric Co.	Cloud Studies, Techniques for Artificial Nucleation of Clouds, Instrumentation.	W36-039-sc-32427	SigC ONR	Aircraft & assoc. personnel furnished by USAF.
adiation Laboratory, Columbia University	General of Supermicrowaves, Microwave Techniques & Apparatus, Microwave Physics, Tube Fabrication.	W36-039-sc-32003	SigC ONR	
anford University	Tunable Circuits and Non-Scanning Spectrum Analysis, Wideband Oscillators, Traveling Wave Tube Principles, Propagation Effects of Ionization Due to Meteors.	N6onr-251 T. O. VII	ONR SigC	
RPL, Bureau of Standards	Propagation Studies		SigC ONR AMC	
aboratory for Insulation Research, MIT	Dielectric Materials, Microwave Research Spectroscopy, X-Ray & Electron Diffraction, High Voltage Breakdown	N5ori-78	ONR SigC	
rmour Research Foundation	Magnetostriction Frequency Control	W33-038-ac-18193	AMC SigC	
olumbia University	Serves in Coordinating all Govt. Sponsored Electron Tube Research and Development.	W28-003-sc-1557	SigC BuShips	Secretariat for Panel on Electron Tubes, RDB
ectro-Technical Lab, Bureau of Mines	Studies on Production of Synthetic Mica	Na-ONR-35-47	ONR SigC	

apply this understanding to the development of methods for localizing individual disturbances over large distances.

Photography. In overall importance to the Signal Corps, this field is second only to Communications. In the past, however, because of strong commercial interests coinciding to a considerable degree with military requirements, it has not been found expedient to support a large-scale research program, since development of military photographic equipments in most cases followed commercial advances through adaptation action. It may, however, be said that research in this field will in the future be greatly increased, for there have arisen many problems which appear now more of military interest than civilian. Some of the fields for future work include such as evaporography, electrostatic electrography, secondary photochemical photography, ion-exchange purification of wash water, non-aqueous developing solutions, light-sensitive materials, ultra-long range ground photography and others.

Joint Service Contracts

It is a matter of policy with the Department of National Defense that research results of interest to elements of the three major Departments be circulated for informational purposes and to prevent duplication. In large contractual research investigations of mutual interest, it has been found expedient for the various interested Services to merge efforts and establish single contracts with joint support. Such contracts are always administered in their non-technical aspects by a Contracting Officer from only one Service, while technical control is vested in an Advisory or Steering Committee made up of members of the participating Services, meeting regularly with the contractor's staff. As an example, the Research Laboratory of Electronics, MIT is conducting research in which all three Departments of the National Defense have great interests. An Advisory Committee for the Services is made up of representatives of the Office of Naval Research, the Air Materiel Command and the Signal Corps. In quarterly meetings of the Advisory Committee with the Research Laboratory of Electronics staff, projects are discussed, initiated or terminated. Broad distribution of quarterly reports and special technical reports assures quick exchange of research information and expedites application. Table I shows the extent of present Signal Corps participation in joint Service contracts, some of which have already been individually mentioned.

Coordination Among Other Services

The program discussed in this paper represents only one phase of related programs also being carried on by various elements of other Services. Coordination on a national scale is accomplished through the Research and Development Board under Vannevar Bush. Except for meteorology, all the projects discussed in this paper fall within the province of the Committee on Electronics, of which Julius A. Stratton is Chairman. The various Panels of the Electronics Committee having cognizance of the work described are Basic Research, Communications, Components, Countermeasures, Electron Tubes, Infrared, Radar, and Radiating Systems. At Panel meetings, Service programs are compared and coordinated, recommendations are made for terminating, initiating or increasing activity on projects within the sphere of influence of the Panels.

Aids to Education

No research is sponsored by the Signal Corps directly as an aid to advance education, although it is happily recognized that such will be a welcome by-product. With approximately an equal balance between funds expended through industrial and academic contracts, it is recognized that through the latter category many graduate students find the support which makes their advance study possible and indirect benefits of inestimable value accrue to the National Defense effort through increase in the country's scientific manpower resources. Within the Signal Corps Engineering Laboratories, in a number of carefully selected cases, research studies are underway, the results of which will be submitted in partial requirement towards doctorate degrees through special arrangements with certain universities located within the New York-Philadelphia area.

It would be well to restate that specific references to every project within the Signal Corps' own Laboratories and among industry and educational institutions has not been possible, either because of their close association with problems involving national security or because of space limitations on this paper.

Operation Sandstone

The first half of 1948 saw great strides taken toward restoring something of our military strength that was so quickly wasted immediately after V-J Day. UMT has so far failed to pass and will have to be considered all over again. Perhaps the most significant accomplishment toward giving the U. S. strength to resist aggression however was the atomic energy tests in the Pacific carried out by Joint Task Force Seven, under the Command of Lt. Gen. John E. Hull, U. S. Army. This report from General Hull's Headquarters in Hawaii is of tremendous interest to all of us who have concern for the protection of America. It includes statements by the three key directors of the operation—Captain Russell, U.S.N. and Dr. Darol Froman, in addition to General Hull himself.

Headquarters, United States Army, Pacific.
Statement of Lt. Gen. John E. Hull, Commander, Joint Task Force Seven

Joint Task Force Seven has successfully completed its mission as assigned by the Joint Chiefs of Staff. This mission was dual in character. First, it was the mission of the task force to construct an atomic energy proving ground for the Atomic Energy Commission at Eniwetok. Secondly, it was required that we assist the AEC in the conduct of the first series of tests of atomic weapons during the months of April and May.

The task force had completed the proving ground by April, in time to permit the conduct of the tests as scheduled. In general, this involved the construction and rehabilitation of housing and living facilities for the scientific group and for troops. Installation of utilities, water, power and communications was required. Fortunately, we were able to use existing structures left over from the war, mostly quonset-type buildings, at the proving ground for housing personnel and for storage and work shops, after repairs, of course. Some equipment was repairable, for instance refrigerating equipment. Considerable savings resulted from these efforts.

It was necessary to repair air strips to permit the landing of heavy planes including C-54's, B-29's and B-17's. Landing facilities for small water craft had to be provided, although cargo had to be off-loaded on lighters from the transport ships.

Construction of the actual testing ground involved special construction for the placement of various scientific instruments and test equipment.

These tests had no kinship to the Bikini tests, the purpose of which was to test the effect on naval equipment and other materials as well as animal and marine life. In the words of the directive given to the Commander of Joint Task Force One, the purpose of the Bikini test was to determine "the effects of atomic explosives against naval vessels in order to appraise the strategic implications of atomic bombs including the results on naval design and tactics." We did not conduct the postponed underwater test Charlie.

The tests of Operation Sandstone were literally and truly field laboratory tests, designed to determine how the bombs now under development by the United States would work and to determine their efficiency. We did just that. We got our answers. We liked the answers. These answers belong to the United States Government, and naturally, are not for publication. It can be said, however, that the bombs worked. We have proved the weapon-development work done by the Los Alamos Scientific Laboratory during the past two years.

This job which we have just completed was begun on 3 April 1947 when the General Advisory Committee of the Atomic Energy Commission concurred in the recommendation of the Los Alamos Scientific Laboratory that tests of certain new designs of weapons be conducted in 1948. The Commission requested and received the President's approval to go ahead with the program in June, 1947.

In September, 1947, preparations had progressed to the point where formation of a Joint Task Force was directed. Joint Task Force Seven actually came into being on 18 October 1947.

As a military organization, Joint Task Force Seven is unique. It was organized along the lines of our best war-time experience, but there was an additional element. As a part of the organization we had a task group which was essentially civilian in makeup. This was the scientific group which conducted the actual tests and which recorded and is still analyzing the results. Captain Russell, who is Deputy Director of the Division of Military Application of the AEC, headed this task group as test director, and Doctor Darol K. Froman, as scientific director for the proving ground, headed the task unit of scientists within the task group. Through Captain Russell, the scientific unit operated technically under the AEC. This task group, by common consent, did not work through my staff. The channels between Captain Russell, Dr. Froman and myself were direct. Dr. Alvin C. Graves served as Deputy Director to Dr. Froman and Mr. Robert W. Henderson and Dr. John C. Clark were Assistant Scientific Directors—all from the Los Alamos Laboratory.

The operation of Joint Task Force Seven, thus organized, was the ultimate in integrated effort and embodied our present-day concept of preparedness—this is the concept we are currently teaching at the National War College—the integrated effort of the Armed Forces with civilian scientists and other specialized civilian elements.

It is a tribute to the scientists who were members of the task force that the operation was successful. The mixing of civilian and military elements in the past sometimes has reacted like oil and water. Joint Task Force Seven was a unified team. Successful accomplishment of its mission was the result of an integrated effort. Much credit for this accomplishment is due Dr. Froman. It has been a real pleasure to have been associated with him on this project.

I want to say on behalf of Dr. Norris E. Bradbury, Director of the Los Alamos Laboratory, that if the men under Dr. Froman are typical of the Los Alamos organization, then research and development in the field of atomic weapons is in good hands.

All of us have been equally impressed with the scientific competence, the technical skill, and the sound judgment of the civilian scientists and technicians assembled for these tests. Our close association has been valuable in many respects and, I am sure, paves the way for a con-

Lt. Gen. John E. Hull, Commander, Joint Task Force Seven.

tinuing and increasing cooperative effort to insure the common defense and security of the people of the United States.

The Military staff of Joint Task Force Seven included Rear Admiral William S. Parsons, USN, and Major General William E. Kepner, USAF, as Deputy Commanders. General Kepner also served as Commander Air Forces, Joint Task Force Seven. Brigadier General Claude B. Ferenbaugh was Chief of Staff.

Naval units of the Joint Task Force were commanded by Rear Admiral Francis C. Denebrink. Brigadier General David A. D. Odgen, USA, commanded Army units of the Task Force and Major General Roger M. Ramey, USAF, was in command of Air Force units under the overall direction of General Kepner.

The major portion of the Joint Task Force sailed from Pearl Harbor on 8 March in ships of the Naval Task Group. Flagship of the force was the command ship USS *Mount McKinley*, veteran of the Pacific war and of the Bikini atomic tests. The four ships of the convoy had aboard the principal participants, both scientific and military. Construction of the proving ground had been commenced in late December 1947 by General Ogden's Army units, in accordance with plans developed in coordination with the Scientific Group. Some of our construction was performed by civilian contract.

One of the more extensive construction projects was that of signal communication. Both radio and telephone service was required. Nearly 1,000,000 feet of submarine cable was laid under the direction of an officer of the U. S. Coast Guard.

Incidentally, it might interest you to know that within the task force in addition to the scientific personnel from AEC's Los Alamos Scientific Laboratory in New Mexico and many other parts of the country, we had engaged at different periods during the preparation for and conduct of the tests personnel from the Army, Navy, including the Marines, Air Force, Coast Guard, Public Health Service, Coast and Geodetic Survey, civilian employees from the different services and civilians working under contract. Consequently, upon arrival of the main body of the task force, the scientific group was able to commence its preparations immediately.

During the period of construction and preparation for the tests some 50,000 measurement tons of material, supplies and equipment were shipped from the mainland and from Oahu to the test area. Some of this was shipped by air although the bulk, of course, went by water.

It was decided at the outset that the most economical means of mounting the operation would be to utilize the existing administrative and logistical channels of the three Services. Primarily, these channels were Commander in Chief, Pacific, and Commander in Chief, Pacific Fleet; U. S. Army, Pacific; Pacific Air Command; the Pacific Division, Air Transport Command; and the Naval Air Transport Service. We also had the services of the Western Ocean Division, Corps of Engineers, Department of the Army, at Sausalito, California; the Naval Supply Centers at Oakland and Port Hueneme, California, and at Pearl Harbor; and the San Francisco and Seattle Ports of Embarkation.

The overall strength of the joint task force was approximately 9,800, including civilian personnel.

Observers of the tests were limited in the extreme, since it was the view of all agencies that only those who had actual need for the knowledge should attend. These observers included personnel of the Joint Congressional Committee for Atomic Energy and its staff, the AEC and the Armed Forces. No other observers were permitted.

To sum up, aside from the value of the tests themselves, the Operation was one of great profit to the Armed Forces. Valuable training in joint operations was gained—training almost impossible to get in peacetime, and generally, all too limited to most members of the military services. Such experience is invaluable in fostering integration within the Services.

Statement of Capt. James S. Russell, USN, Test Director, Task Force Seven

On behalf of the United States Atomic Energy Commission, I wish to acknowledge the outstanding contribution to progress in the development of atomic weapons which General Hull has made as Commander Joint Task Force Seven.

Joint Task Force Seven was formed because the scope of operations at the Commission's Proving Ground at Eniwetok required the assistance and services of all Departments of the National Military Establishment. Joint Task Force Seven provided the command structure, the military and internal security, the means for an overseas movement to a base 4,500 miles from the mainland, the construction force, and the operating force for the Eniwetok Proving

Ground. Not only was it a completely unified operation of the Army, Navy, and Air Force including the Armed Forces Special Weapons Project, but it was a combined operation of military personnel and civilian scientists and technicians of the Atomic Energy Commission and its contractors.

The support given to the AEC Proving Ground Group which conducted the tests was complete, and without the assistance of military personnel in the technical phases of the operations, the test program could not have been carried out.

The successful completion of this test program is a triumph for the Los Alamos Scientific Laboratory, where weapon development work for the Commission is carried on. It is also a triumph for Dr. Darol K. Froman and the remarkable scientific and technical staff which he assembled for these tests. Again on behalf of the Atomic Energy Commission, I wish to congratulate Doctor Froman and his staff.

As Test Director for the Commission, I want to pay tribute to the work of Dr. Alvin C. Graves as Deputy Scientific Director under Doctor Froman, to Colonel Paul T. Preuss, USAF, as Deputy Test Director.

In order to understand the importance of the operations of Joint Task Force Seven it is necessary only to consider the reasons why these tests were held. During the period of wartime development of atomic energy, the one goal relentlessly pursued was the creation of an atomic bomb which would work—and work in time to be effective in World War II. It had only to work; it needed not to be thoroughly efficient, and the related problems of engineering and production were dealt with in the urgency of wartime conditions.

The bomb did work. It worked initially at Alamagordo, N. M., where the first test took place on July 16, 1945. It worked again at Hiroshima and Nagasaki, then the following year at Bikini. But all of these weapons, as far as their state of development is concerned, were about on a par. They were the wartime weapon—designed under extreme pressure and without regard for many problems which in the long run are of great importance in the military application of atomic energy.

In its January Report to Congress, the Atomic Energy Commission said its goal in the field of weapon development was the scientific and engineering perfection of improved designs, and that thorough testing of weapons and components is necessary to improved design.

In any program of developing and producing weapons, the need for proof testing, or for conducting full scale experiments, is natural and obvious. Failure to test new developments would soon throttle the design of improved weapons. America's preeminence in the field of atomic weapons is not a static thing, it depends upon achievement—day to day, year to year, and test to test achievement.

Statement of Dr. Darol K. Froman, Scientific Director, Joint Task Force Seven

General Hull and Captain Russell have outlined the historical background leading up to the 1948 program of atomic weapon tests and the organization of the Task Force which was formed to carry out the program. Although the tests were conducted by a combined military and civilian team, Joint Task Force Seven is a military organization with a great majority of its personnel from the Armed Forces. However, the spirit of cooperation which existed between the military and civilian personnel resulted in the smoothest possible operation. Throughout the whole life of the joint task force, there has not been a single incident which impeded any test of measurement and which arose from the rather great differences between military and civilian philosophies and methods of operation. The mixing was really very intimate; for example, most of the technical sections were staffed with both civilians and members of the Armed Forces Special Weapons Project.

A year ago I would not have believed such a pleasant and successful working relationship could be achieved, and I believe now that it resulted in this case from the broad understanding and wisdom of General Hull. He has set a standard for all future integrated projects involving the armed forces and civilian groups. To have been a member of his organization has been a most pleasant experience for me personnally, and I believe for all the civilians of the task force.

The task unit responsible for carrying out technical operations and making scientific measurements was part of the task group commanded by Captain Russell. Captain Russell also represented the Atomic Energy Commission as Test Director. Only his wide and intimate knowledge of the organization, activities, and technical work of the commission, and of military operations — particularly naval and air operations — made it possible for us to do the job required. Since the beginning of this project, Captain Russell and I have worked very closely together. We have even shared the same room for the past three months. We are now nearing the end of one of those rare experiences which someone as lucky as I sometimes finds and which marks a highlight in one's life.

The deputy commanders of the task force, Major General W. E. Kepner, USAF, and Rear Admiral W. S. Parsons, USN, were of great assistance throughout the operations. General Kepner's intimate knowledge of so many phases of air operations contributed directly to the success of our more important experiments. Admiral Parson's wide experience and understanding in the field of military applications of atomic energy were of the greatest value.

The test program just completed at the Eniwetok Proving Ground involved a series of nuclear explosions, carried out under conditions as close to laboratory control as we could make them, and with very extensive instrumentation.

The technical and experimental work really fell into two categories. As General Hull has said, the purpose of these tests was not to find the effects of atomic explosions on materiel and equipment as at Bikini. Yet, since the detonations were to be made, several agencies of the armed forces carried out tests of this kind. Many of these tests were not very extensive and, in general, they were designed to fill in gaps in the knowledge gained at Bikini. Armed forces and other government agencies participating included the Corps of Engineers, the Chemical Corps and the Signal Corps from the Army; the Navy Bureau of Ships, Bureau of Medicine and Surgery and Bureau of Yards and Docks; The United States Air Force; the Armed Forces Special Weapons Project; United States Coast and Geodetic Survey; and the United States Public Health Service. These tests were successful in the sense that the desired data were obtained.

The second category of tests and experiments was designed to answer questions arising in connection with the military applications of atomic energy. The program for this work was laid out at the Los Alamos Scientific Laboratory. It was quickly realized, however, that if all the technical personnel required were

First press conference after return from Eniwetok. L to R: Maj. Gen. W. E. Kepner; Dr. Darol K. Froman; Lt. Gen. J. E. Hull; Capt. James Russell; Rear Adm. W. E. Parsons.

drawn from that laboratory, other very important work would suffer seriously. The problem was solved by forming a skeleton organization at Los Alamos, consisting of one expert in each phase of the technical work. In some cases, where the work of the laboratory would not be too badly impeded, scientists and technicians were drawn from the Los Alamos staff to carry out certain technical operations under these experts acting as section leaders. In other cases the University of California, which operates the Los Alamos Laboratory for the commission, made contacts with outside agencies. In these cases the Los Alamos experts filled liaison positions.

The technical work in which naturally I have the most interest, has received the very best support from both the Atomic Energy Commission Headquarters in Washington and the Los Alamos Laboratory. In fact, one of the commissioners, Dr. Robert F. Bacher, spent about three weeks with us at Eniwetok. During this time he contributed very significantly to the success of the operation by assisting with the interpretation of the data. Also, Dr. N. E. Bradbury, Director of the Los Alamos Laboratory, spent an even longer time in the field with us doing similar work.

Dr. Alvin C. Graves as Deputy Scientific Director, and Mr. R. W. Henderson and Dr. John C. Clark as Assistant Scientific Directors—all from the Los Alamos Laboratory—have formed a highly qualified committee making scientific and technical decisions on what to do and how to do it. It has been a great personal satisfaction to me to be so closely associated with these men and I have the highest regard for the ability of each of them. Dr. Graves and I have worked so closely for several years we each have learned how the other thinks. It was easy to learn since we think alike, and when Graves does a job I always feel that it has been done as I would have done it but just a little bit better.

Among the organizations outside the Los Alamos Scientific Laboratory taking part in the technical program at Eniwetok were the Naval Ordnance Laboratory at Washington, D. C.; the Aberdeen Proving Ground (Army Ordnance Dept.) at Aberdeen, Maryland, and the Navy's David Taylor Model Basin at Washington, D. C., all supplying technical personnel for pressure and blast measurement work.

The Argonne National Laboratory at Chicago provided a group to measure gamma radiation from the bursts. Another of the important jobs was the technical photography which required automatic, remotely-controlled cameras, some taking more than 10,000 pictures a second. Technical photography was done by the Air Force and civilian cameramen. Several important technical jobs were done by sections drawing personnel from the branch of the Los Alamos Scientific Laboratory at Sandia Base at Albuquerque.

Apart from the Los Alamos Laboratory the largest single supplier of personnel for the Atomic Energy Commission Proving Ground Group was the Armed Forces Special Weapons Project. About one hundred commissioned and non-commissioned officers of the AFSWP were members of the various test units. Like all of our other technical personnel, these officers did a very fine job indeed. Every one of the technical sections turned out very high quality work. I wish to mention in particular that each of the outside contracting agencies planned and executed an effective and finished operation. They are to be commended highly.

The ultimate purpose of the tests was to insure efficient utilization of the national resources required for the development and application of atomic energy. Captain Russell has suggested to you that the Los Alamos Laboratory had developed new weapon designs. It is obvious that a research and development program of any nature cannot long be fruitful if the product of the program never gets tested. If the nation elects to develop and manufacture atomic weapons, these weapons must be tested. Unlike other bombs, however, the cost in actual cash, man hours and natural resources is quite high for each weapon. Moreover, the physical processes going on during the explosion of an atomic bomb are very complicated. For these reasons, development and improvement of atomic weapons cannot be carried on by the common methods of making small changes in current models and proof-testing after each change.

A very great deal of physical research and mathematical analysis goes into the plans of an atomic weapon. Therefore, tests of the kind we have just completed are designed primarily to provide experimental data necessary for a better understanding of the process of nuclear explosion and necessary to form a sound basis for improved design of weapons. Certainly such tests do include proof-firing new models of weapons, but the model types must be selected carefully in order to make information obtained from one test supplementary to that obtained from another. A well planned series of atomic weapon tests can yield much more information than an equal nummer of unrelated single tests.

Proof-tests of new models often can be carired out under conditions that make it possible to attain secondary, but important objectives. Without interference with the primary objective much information can be gained which is useful in the peaceful applications of atomic energy.

We have not had time to tabulate and analyze but a small portion of the experimental data obtained in these tests. Yet, what we have learned already would have been enough to make the tests profitable. We are very pleased with the results. Our tests were successful not merely because the weapons we used exploded with a loud bang. They were successful because the weapons did explode and we obtained good experimental data which will guide us in research and development in the future.

One of the most gratifying results of the entire operation has been the confirmation of the large body of ideas, theories and methods which have grown out of the theoretical and experimental work done since the war at the Los Alamos Laboratory.

ASSOCIATION AFFAIRS

ARMED FORCES COMMUNICATIONS ASSOCIATION

1624 I Street, Washington 6, D. C.

OFFICERS AND DIRECTORS

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Brig. Gen. S. H. Sherrill, U.S.A., (Ret.)

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H. A. Ehle (1949)
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John J. Ott (1949)
Dr. Harold A. Zahl (1949)
Carroll O. Bickelhaupt (1950)
Theodore Gary (1950)
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William C. Henry (1951)
Dr. Frank B. Jewett (1951)
Fred R. Lack (1951)
Leslie F. Muter (1951)
Charles E. Saltzman (1951)
S. H. Sherrill (1952)

GROUP AND LIFE MEMBERS

The following organizations have become group members:

American Time Products, Inc.
De-Jur Amsco Corporation
Drake Manufacturing Company
Ilex Optical Company
Leich Sales Corporation
Machlett Laboratories, Inc.
P. R. Mallory & Co., Inc.
National Carbon Company, Inc.
Olin Industries, Inc.
Servo Corporation of America
Sherron Electronics Company
Stewart-Warner Corporation
Tyler Commercial College

The following have been made Honorary Life members:

Maj. Gen. Harold M. McClelland
Rear Admiral Joseph R. Redman

The following have become Life members:

Lt. Col. John O. Aalberg
Capt. William H. Angel
William B. Cook
Lt. Col. Ira H. R. Genet
John T. Snodgrass, Jr.
Maj. Hubert F. Wehlitz

Coordination

Several members have pointed out from time to time that, in their opinion, greater coordination between engineering and supply is necessary in order to ensure that military communications equipment as designed is procurable in quantities needed for a national emergency. The Executive Secretary conferred on this subject with Maj. General A. C. McAuliffe of the Armed Forces Research and Development Board. He stated that there is an electronics committee of this Board which is charged with this important phase of industrial mobilization. Dr. Julius Stratton of MIT, and one of AFCA's Directors, heads up this committee. There is close collaboration between this committee and the Munitions Board in all industrial planning.

Agencies for Uniformity

Secretary Forrestal, on 10 June, stated that the chairman of the Munitions Board had announced the establishment of the Munitions Board Standards Agency and the Munitions Board Cataloging Agency. The function of the standards agency is to develop standardized equipment for the National Military Establishment. The task of the cataloging agency is to develop a uniform catalog of all items used by the Military Establishment in peace and war.

Establishment of the two agencies was the result of a World War II realization by the military departments that standardization of equipment and a uniform catalog for the armed services were essential to an efficient and economical military supply system. Moves were initiated separately by the War and Navy Departments toward achievement of catalog uniformity within their own services. By June of 1947, progress had been made by the technical services of the War Department and the bureaus of the Navy, and the Navy had embarked on a program of uniformity among all its bureaus.

Before the National Security Act of 1947, the cataloging efforts of the Army, Navy and Air Forces were coordinated by the old Army and Navy Munitions Board Cataloging agency. This agency laid the organizational groundwork from which grew the recently announced Munitions Board Cataloging Agency.

The program already has produced a manual for supply cataloging, which is a handbook designed to guide all personnel in cataloging principles. Procedures of the three military departments have been developed for the collaboration in cataloging activities, and an agency staff charged with the correlation of all cataloging material received from the services has been formed.

New Annual Dues

In the account of the Directors Meeting which appeared in May-June SIGNALS the increase in annual dues was announced. The new $5 rate for full members has gone into effect for those chapters which are now organized to handle renewal procedures and will be in effect for all full members joining or renewing after August 31, 1948 — thus permitting charter members to renew for this year at the old $4 rate. The same is true for the new group rate of $200 except that the Executive Committee, acting under Sec. 4, Article III of the Consti-

National Advisory Committee Chairmen

GENERAL MANUFACTURING: Mr. Fred R. Lack, V. Pres., Radio Division, Western Electric Company, New York City

BATTERY MANUFACTURING: Dr. George W. Vinal, Bureau of Standards, Washington, D. C.

DRY BATTERY SUBCOM.: Mr. Ralph E. Ramsay, V. Pres. & Research Director, Ray-O-Vac Company, Madison, Wisconsin

STORAGE BATTERY SUBCOM.: Mr. L. E. Wells, Chief Engineer, Willard Storage Battery Company, Cleveland 1, Ohio

RADIO MANUFACTURING: Mr. Fred R. Lack, V. Pres., Radio Division, Western Electric Company, New York City

TELEGRAPH EQPT. MFG.: Colonel Julian Z. Millar, The Western Union Telegraph Company, New York City

TELEPHONE EQPT. MFG.: Mr. C. D. Manning, V. Pres., Kellogg Switchboard & Supply Company, Chicago, Illinois

COMPONENTS MFG.: Mr. R. C. Ellis, V. Pres., Raytheon Manufacturing Company, Waltham, Masachusetts

PHOTOGRAPHIC EQPT. MFG.: Mr. H. A. Schumacher, V. Pres., Graflex, Inc., Rochester, N. Y.

RADAR: Mr. George F. Metcalf, Manager, Electronics Laboratory, General Electric Company, Syracuse, N. Y.

WIRE MANUFACTURING: Mr. H. Donn Keresey, Pres., Anaconda Wire & Cable Co., New York City

PUBLICITY: Mr. Roland C. Davies, Telecommunications Reports, Washington, D. C.

MILITARY TRAINING: Major Gen. G. L. Van Deusen, Pres., RCA Institutes, Inc., 340 West 4th St., New York 13, N. Y.

tution, has authorized a special rate of $100 per year for group members in the "small business" category. This is defined in U. S. Senate Bill S2655 as any firm with 500 or less employees and which is independently owned and operated. Of this $100, ten will go to the chapter area in which the main office is located.

AFCA Award

The following is quoted from the order read at a special presentation parade at West Point on June 6th:

> "The academic awards, donated annually by patriotic societies and prominent personages, as rewards to cadets for outstanding qualifications in academic work, will be presented to the cadets indicated below on The Plain at 1730 DST, 6 June 1948. Advantage is taken of this opportunity to congratulate the cadets on whom these awards are to be bestowed, and to express the appreciation all feel toward the patriotic societies and individuals who have made possible the presentation of these awards.
>
> The 1948 awards consist of:
>
> . . . . . .
>
> r. The Radio Receiver, presented by the Armed Forces Communications Association, for the highest rating in Electricity, to Cadet William C. Burns, 1st Class. This award presented for the first time this year."

Dayton Meeting Publicized

Some 48 different newspapers throughout the country, from New Hampshire to California, and Minnesota to Texas, commented on the speech made by AFCA President Sarnoff at our banquet May 11 in Dayton. Many emphasized editorially the increased importance in communications in the warfare of tomorrow—especially the part that television can play. These notices helped carry out one of AFCA's objectives—that is, to help focus attention on the importance of communications in the warfare of tomorrow.

Problems to Chapters

Mr. Fred R. Lack, General Chairman of our Advisory Committees, has distributed several problems sent to AFCA by the Armed Forces for study to selected chapters whose reports will be sent to Mr. Lack for coordination with his own studies.

Gary at OCSigO

Mr. Theodore S. Gary, Director of AFCA and Vice President of the Automatic Electric Company, presented to officers on the staff of the Chief Signal Officer, in a conference there in June, certain ideas which he considered helpful in planning for industrial mobilization.

Reports to Group Members

One copy of Mr. Leighton Peebles' staff report on communications to the Director of the National Security Resources Board, mentioned elsewhere in this issue, and one copy of the Munitions Board's "Guide for Joint Industry-Military Planning" were sent by national headquarters to each group member in June.

Signal Officers at AFCA Hq

Col. T. H. Maddocks, Signal Officer of the Third Army, and Col. T. J. Tully, in charge of the Alaska Communications System, discussed AFCA problems in their areas during visits at National Headquarters last month.

WHEN DOES YOUR MEMBERSHIP EXPIRE?

Look at the expiration date on your membership card. If it is within 30 days, it's time to pay your dues. Fill in this form and return with the correct remittance. If you do not use the form please pass it on to a friend for his use in applying for membership.

Armed Forces Communications Association
1624 Eye Street, N.W., Washington, D. C.

Enclosed is $..... for membership (new) (renewal) for one year in the AFCA.
(Full—$5.00) (Retired or Enlisted —$3.00) (Student $2.00)

Name .....

Address .....

City ..... State .....

REPORT OF ANNUAL MEETING OF BOARD OF DIRECTORS

1. The Board of Directors held its annual meeting, required by Sec. 4, Article III of the Articles of Incorporation, at 10:30 A.M., May 11, 1948, in the Biltmore Hotel, Dayton, Ohio.

Present were:
David Sarnoff, President and Director
A. W. Marriner, Vice President and Director
J. H. LaBrum, Director
Theodore Gary, Director
Thomas A. Riviere, Director
S. H. Sherrill, Executive Secretary and Director

Also present were representatives of the following chapters who are Council members under Sec. 2, Article III of the constitution:

Atlanta, J. H. Young
Baltimore, Walter Evans
Chicago, Theodore S. Gary
Cleveland, Mr. Thompson
Dayton, E. H. Bobzean
Decatur, Colonel Stice
Monmouth, Colonel Tatum
Kentucky, Colonel Mack
New York, Colonel Dixon
Phila., Colonel W. W. Watts
St. Louis, Colonel Popkess
Washington, E. A. Corey

Also present were Major General H. C. Ingles, member at large of the Council and Rear Admiral Earl E. Stone, Chief of Naval Communications; Major General Francis L. Ankenbrandt, Director of Air Communications; Colonel Harrod Miller, for the Chief Signal Officer of the Army.

2. The President took the chair, called the meeting to order and proceeded to the transaction of business as follows, as listed on the agenda:

(a) The following were elected directors for four years until July 1, 1952: Jennings B. Dow, E. K. Jett and S. H. Sherrill.

The following were elected vice presidents for one year until July 1, 1949: Jennings B. Dow and E. K. Jett.

(b) A proposal to adopt a resolution urging the proper government officials to modify selective service regulations for the anticipated draft to ensure protection for the communications industry was discussed and tabled.

(c) The Executive Secretary presented the financial report and discussed the balance sheet and profit and loss statement.

(d) A motion was made, seconded and adopted to amend par. 13 of the by-laws by increasing the annual dues for full members from $4.00 to $5.00 and for group members from $100.00 to $200.00, effective not later than January 1, 1949. The first of these changes is in line with increases already made by most of the other military associations and by some of our own chapters who have been collecting dues as previously prescribed by the constitution.

A motion was then made, seconded and adopted to delete the last sentence and amend the second and third sentences of par. 23 of the by-laws to read:

"The local chapter, as soon as it shall be organized to accomplish it, will collect annually at the new rate, all dues, both original and renewal, for all of its individual members. The sum of $1.00 shall be withheld by the chapter for each full (or $5.00) member and the remaining $4,00 together with application form submitted by the member or a report to show data listed on his application will be sent to National Headquarters. Fifty dollars of the annual group membership fee of $200.00, either original or renewal, shall be remitted to the chapter by National Headquarters if the remittance is made to that office; otherwise, $50.00 shall be withheld by the chapter and the remaining $150.00 forwarded with the application form to National Headquarters."

These changes in the by-laws require no further action, the Board of Directors being authorized, under Sec. 6, Article III of the Constitution to amend the by-laws.

(e, f) No action was taken on proposals to change the name "full member" and to add an "engineering member."

(g) A motion was made, seconded and adopted to request Dwight Palmer, J. Harry LaBrum and William Halligan

TREASURER'S REPORT

As stated in our first annual report we have practiced rigid economies in the administration of the Association. The year's results can be said to be satisfactory since Armed Forces Communications Association did not operate at a large loss as so many other associations did. Our financial position is on the whole fairly strong and secure. Auditing committee, consisting of Col. Rolland Stafford, Col. Bertram Sherry and Mr. Durden, CPA, completed the audit on July 20. A budget for FY 1949 has been set up which is believed to be realizable, provided renewals continue at the high rates of May and June, until August 31.

FINANCIAL STATEMENT
Fiscal Year Ending 30 June 1948

ASSETS

Current Assets:			
Cash:			
Petty Cash	**$ 25.00**		
Cash—Checking Account	**6,171.48**		
Cash—Savings Account	**3,049.93**		
U. S. Government Bonds	**8,500.00**		
Total Cash			**$17,746.41***
Accounts Receivable:			
Advertising	**$1,389.00**		
Advertising Contracts	**3,518.09**		
Subscription Contracts & Misc.	**1,249.76**		
Total Accounts Receivable		**6,156.85**	
Total Current Assets			**$23,903.26**
Prepaid Expenses:			
2nd Class Permit and Rent Deposits	**$ 218.65**		
Prepaid Insurance, etc	**115.31**		
Total Prepaid Expenses			**333.96**
Fixed Assets:			
Furniture & Fixtures	**$1,161.36**		
Library	**34.81**		
Total Fixed Assets			**1,196.17**
Total Assets			**$25,433.39**

***Includes $13,496.12 renewals for FY 1949 memberships.**

LIABILITIES AND NET WORTH

Current Liabilities:			
Accrued Wages	**$ 288.00**		
Accounts Payable—Chapters and Trade Crs.	**713.42**		
Accrued F.O.A.B. tax	**73.52**		
Accrued Commission Expense Payable	**123.80**		
Advancements Received for Orders Placed	**18.45**		
Total Current Liabilities		**$ 1,217.19**	
Unearned Dues and Surplus		**24,216.20**	
Total Liabilities & Net Worth			**$25,433.39**

The budget for FY 1949 is based on monthly expenses totaling $3,026 plus a safety factor. Principal monthly items are:

Publication, Signals & Bulletin	**$1,099**
Salaries—7 employees, some part time	**1,393**
Promotion & Circulation	**224**
Rent & Utilities	**180**

to serve on a committee to investigate the desirability of attempting to establish an endowment fund similar to that had by the Ordnance Association.

(h) No action was taken on a proposal to adopt a resolution to implement AFCA's purposes.

(i) A motion was made, seconded and adopted to submit problems of production capacity and allied matters to selected chapters as well as to the National Advisory Committees of the association. The solutions and recommendations reached by committees of the chapter would be submitted to the general chairman of our advisory committees who would then send them to the national defense board or office which originally requested the study. A report of the studies made during the year should be submitted to the Council at the annual meeting.

(j) A motion was made, seconded and adopted to offer honorary life membership to all previous chiefs of Naval and of Air Communications who have served for a total of three or more years in peacetime and one or more years in war time and who have previously indicated their interest in the Association and its purposes by becoming members. Action extending membership to former Chief Signal Officers of the Army was taken in 1947.

(k) A motion was made, seconded and adopted to amend Sec. 2, Article III of the constitution to provide that the Council shall, in addition to electing the Board of Directors, be the governing body of the association.

(l) It was moved, seconded and adopted that the term of office of the President and Vice Presidents of the Association should be reduced from two to one year, beginning May 1, 1949 and that Sec. 3, Article III of the constitution be amended accordingly.

(m) A motion was made, seconded and adopted to prepare and submit a resolution offering AFCA assistance to the chairman of the National Security Resources Board, the chairman of the Munitions Board and the Secretaries of the Army, the Navy and the Air Force.

(n) It was moved and seconded that a committee of three members of the association, under the chairmanship of George R. Call of Sioux City, who would select the other two committee members, be appointed to study the need for further planning, over and above what has already been accomplished by the Armed Forces, to make use of the nation's radio amateurs in case of national emergency.

(o) The final vote of the meeting was for the 1949 meeting to be sponsored by the Navy at a location to be selected by the Navy Department, in late April or early May. A two-day meeting, beginning on a Monday, was considered preferable, with the Council meeting to be held on the afternoon of the first day before the banquet.

The amendments to our constitution outlined in paragraph 2 (k) anl (l) of the directors' report require voting by the membership. Please enter your vote on the form below, tear it out and mail it to the Executive Secretary not later than September 10, 1948. Signature is not required.

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☐ For ☐ Against — proposed amendment to Sec. 2, Article III AFCA Constitution to read as follows:

"Sec. 2. The Council shall elect the Board of Directors. It shall consist of (1) one representative for each 100 members or fraction thereof of each chapter elected by the chapter members for a period of one year beginning on January 1st each year, (2) the three immediate past presidents, (3) the current national officers and national directors. The National President of the Association or senior Vice President in his absence shall serve as Council chairman. The Council shall have power to fill unexpired terms of its members. It shall meet once each year at the call of its chairman but, if necessary, its business may be transacted by letter. A majority vote of its members voting, in person or by letter, shall be necessary for election to membership on the Board of Directors."

☐ For ☐ Against — proposed amendment to Sec. 3, Article III, AFCA Constitution to read as follows:

"Sec. 3. The officers shall consist of a President, a First Vice President, a Second Vice President and such additional numbers of Vice Presidents, not to exceed three, as may be authorized by the Board of Directors, all of whom shall be elected by the Board of Directors from its own membership for a term of one year, and a Counsel, a Treasurer, and an Executive Secretary who shall be elected by the Directors and who shall hold office a minimum of four calendar years and until their successors have been elected and qualified. Regular Service personnel while on active duty status shall not be eligible to hold other than an honorary national office in the Association."

☐ For ☐ Against — proposed amendment to Sec. 4, Article III, AFCA Constitution to read as follows:

"Sec. 4. The Board of Directors shall consist of the three immediate past presidents, the president (who shall be ex officio chairman), the vice presidents, 16 other members elected by the Council, all to serve four years from the 1st of July following their election, and the representatives of the chapters, chosen as Council members in the manner prescribed under Sec. 2 of this Article. The Board of Directors shall have the power to fill casual vacancies in the case of its members and in the offices of President, Vice Presidents and other National officers and to initiate and execute measures necessary to achieve the objects of the Association. The Board shall meet at least once each year, usually at the same time and place as the annual Council meeting."

CCMA—now CCAFA

The Coordinating Committee of Military Associations held its last meeting for the summer at the Army-Navy Club, Washington, D. C., on June 22d. It was also the last meeting held under its old designation of CCMA. Because of the Navy Industrial Association's participation in the meetings, and because of the Air Force's separation from the Army, it had long been felt that the committee should use the more clearly inclusive "Armed Forces" in its name. Formal action on the name change was taken, and the committee is henceforth The Coordinating Committee of Armed Forces Associations.

Ludlow King, of the Fiber Glass Corporation, and former president of Armed Forces Chemical Association, was re-elected chairman of the committee.

For the resumption of meetings in the fall a program was discussed, and the following action was agreed on:

a. The chairman to invite the Chiefs of Information, Army, Navy and Air Force to be guests at the first meeting in the fall, and at all meetings thereafter, for the purpose of giving the several associations advance information on trends and projects in the Armed Forces so that association members may in certain cases receive early advices of such matters, either by news items or editorial comment in our journals or by special newsletters. Committee members should be prepared to ask questions of these officials at the meetings. (*Such questions would, of course, include any that AFCA members may submit to National Headquarters.*)

b. The committee to sponsor through local association chapters, regional Industry-Army Day meetings this fall and winter similar to those last year in Seattle and Omaha; and a National Industry-Army Day, probably at some eastern city, similar to the one in 1947 at Chicago and in 1948 at Dallas. For the National meeting January will probably be the month. It was decided not to undertake an Industry-Armed Forces Day this year because of plans for separate celebrations by Navy Industrial Association and Air Force Association.

c. A motion to take concerted action in an effort to secure a uniform arrangement for the granting of paid absences by industry to permit reservists to take military training was tabled.

Chapter News

. . . . Chapter Of The Year, 1948 — Far East, George I. Back, President

CHAPTERS AND SECRETARIES

ATLANTA: Maj. Peter J. Ryan, Hqs. 3rd Army, Ft. McPherson, Ga.

BALTIMORE: Col. Walter J. Rosengren, Baltimore Signal Depot, Middle River, Md.

BOSTON: Capt. F. P. Singleton, Boston Army Base, Boston 10, Mass.

CHICAGO: Col. Raymond K. Fried, 111 W. Monroe St., Chicago 3, Ill.

CLEVELAND: H. E. Schafer, Radiart Corp., 3751 W. 62nd St., Cleveland 2, Ohio.

DALLAS: E. H. Mittanck, Rm. 816, Telephone Bldg., Dallas, Tex.

DAYTON: Gertrude A. Knight, 54 Patterson Village Dr., Dayton, Ohio.

DECATUR: E. C. Whitcomb, RR 6, Box 263, Decatur, Ill.

EUROPEAN: M/Sgt. C. F. Ohmer, Hqs. Co., 7772nd Signal Bn., APO 757, New York, N. Y.

FAR EAST: Maj. C. B. Whittenberg, Sig. Sec., GHQ., FEC, APO 500, c/o PM, San Francisco, Calif.

FORT MONMOUTH: Col. William L. Seibert, Squier Signal Laboratory, Fort Monmouth, N. J.

KENTUCKY: Capt. John A. Short, Lexington Signal Depot, Lexington, Ky.

NEW YORK: Col. William A. Harrington, 100 William St., Room 1102, New York, N. Y.

OGDEN-SALT LAKE: Miss Marjorie Hansen, 2227 Adams Ave, Ogden, Utah.

PHILADELPHIA: Joseph Bergman, Sig. Corps Stock Control Agency, 2800 So. 20th St., Philadelphia, Pa.

PITTSBURGH: Capt. J. J. McGovern, Bell Telephone Co., 229 Spahr St., Pittsburgh 6, Pa.

RICHMOND: Miss Jean Melton, Ches. & Potomac Tel. Co., 703 E. Grace St., Richmond, Va.

RIO: Maj. Huston Maxwell, JBUSMC, APO 676, % Pm, Miami, Fla.

SACRAMENTO: Lt. Col. George H. Melvin, Jr., Sacramento Signal Depot, Sacramento, Calif.

SAN FRANCISCO: Capt. John H. Meyer, 275 Turk St., San Francisco, Calif.

ST. LOUIS: Capt. Henry C. Hughes, 319 No. 4th St., St. Louis 2, Mo.

SEATTLE: Capt. Lawrence W. Bucy, Alaska Communication System, Seattle 4, Wash.

WASHINGTON: Col. Edward C. Cover, Chesapeake & Potomac Tel. Co., 725 - 13th Street, N. W., Washington, D. C.

STUDENT CHAPTERS

CORNELL: John M. Ross, 126 McFaddin Hall, Ithaca, N. Y.

NEW YORK UNIVERSITY: Robert D. Hawkins, 25 Spruce Ave., Ridgefield Park, N. J.

OKLAHOMA A & M: W. L. Covel, Mil. Dept., Okla. A & M College, Stillwater, Okla.

STATE COLLEGE OF WASHINGTON: Stuart W. McElhenny, 604 California St., Pullman, Wash.

UNIVERSITY OF CALIFORNIA: R. G. Barhite, Bowles Hall, U. of Calif., Berkeley, Calif.

NATIONAL HEADQUARTERS CHAPTERS SECRETARY: JULIA GODFREY

Atlanta

The annual business meeting of the Atlanta Chapter was held on May 4th. Officers were installed as follows: President—Mr. D. A. McKeever; 1st Vice President—Mr. J. L. H. Young; 2nd Vice President—Lt. Col. M. S. Moody; 3rd Vice President—Mr. R. J. Jernigan; 4th Vice President—Sgt. E. Turcotte. Speakers at the meeting were Lt. Col. Moody, who discussed his assignment as Third Army observer at the Amphibious Maneuvers in the Antilles in February 1948; and Col. Maddocks, who reported on the results of the Army Signal Officers' Conference at Fort Monmouth.

On June 8th, 100 members and guests attended a dinner-meeting at the Naval Air Station outside Atlanta. Capt. E. T. Neale, Commanding Officer of the Naval Air Station, was host at the dinner. The principal speaker was Maj. General William O. Reeder, Deputy Director, Logistics Division, General Staff, USA. Lieut. General A. C. Gillem, Commanding General, Third Army, introduced General Reeder. Also present was Col. Robert C. Paul, Commanding Officer of the Marietta Air Base. General Reeder's topic was "Signal Trends and the Part Industry Must Play in Assisting the Armed Forces."

The Atlanta Chapter has initiated an award which it will present annually to the Army or Air Force ROTC student or NROTC student in the communications course at the Georgia School of Technology having the highest rating in scholarship and in Military, Naval, or Air, Science and Tactics. The first award was presented on May 27th by Chapter President McKeever to Cadet 1st Sgt. John C. Gall, ROTC Unit. The award consisted of an embossed slide rule.

Baltimore

The June 8th meeting of the Baltimore Chapter was held in the auditorium of the Enoch Pratt Library. The results of the annual election were announced as follows: President—F. E. Moran; 1st Vice President—A. S. Hunt; 2nd Vice President—A. B. Haneke; 3rd Vice President — Capt. Paul E. Dugan; Secretary—Col. Walter J. Rosengren; Treasurer—Lt. Col. Olin L. Bell.

Mr. E. K. Jett, Vice President and Director of Radio of the Baltimore Sunpapers, and also National Vice President of AFCA, spoke on "Tele-Communications — International and Domestic."

Chicago

The new president of the Chicago Chapter is Oliver Read, Editor of "Radio News."

Cleveland

The second annual meeting of the Cleveland Chapter was held on May 26th at the Cleveland Engineering Society. The following members were elected to the Board of Directors: W. S. Sparling, H. E. Schafer, L. A. King, and F. D. Gilliland. At the conclusion of the business meeting, Mr. Oliver Henderson gave an entertaining talk on the subject of "Microwaves."

Decatur

On May 20th, some eighty members and guests of the Decatur Chapter attended the last dinner meeting of the season. Among the guests was Mr. Charles Harris, manager of the new General Electric plant in Decatur which is devoted to the manufacture of plastics. The speaker of the evening was Mr. Kingsley W. Given, Chief of the Lecture Branch, Chemicals Division, General Electric Company. Mr. Given presented an illustrated lecture on plastics.

A joint meeting of the St. Louis and Decatur Chapters is being planned for late July or early August in the St. Louis area. It will be in the form of a barbecue and a river trip. All AFCA members who will be in the vicinity of St. Louis at that time and who wish to attend should

contact the secretary of either chapter.

Fort Monmouth

Over 100 members and guests were present at the chapter dinner meeting on May 28th at Gibbs Hall. After the dinner, all assembled in the Sapphire Room where the chapter president, Lt. Col. Charles S. Hays, announced the results of the recent annual election and introduced his successor, Col. William A. Beasley, Director of Squier Laboratory.

Brig. Gen. F. H. Lanahan, Fort Monmouth Commander and a charter member of the European Chapter, spoke briefly, as did Brig. Gen. S. H. Sherrill, National Executive Secretary, who had come from Washington for the meeting. He pointed out that during the period between World War I and II the laboratories at Monmouth were prevented, by lack of appropriations, from carrying out much of the development of new equipment that it was known was needed. He emphasized that one of the major objectives of AFCA is to bring industry and the military closer together and to keep constantly before those in authority the need for funds for the support of laboratories and military communications development. Gen. Sherrill stressed, especially, the need for utilizing the vast development laboratories of industry to contribute toward better communications and photographic equipment and procedures. To ensure this, he said that AFCA membership must grow to a total of at least 20,000.

Mr. H. C. Harsh, Manager of the Development Dept. of ANSCO, gave a most interesting demonstration of the latest in color photography.

Among the out-of-town guests were Rear Admiral Joseph R. Redman, former Chief of Naval Communications; Col. W. W. Watts, President of the Philadelphia Chapter; Col. George P. Dixon, former AFCA Director and President of the New York and Rio Chapters; Maj. General R. B. Colton, formerly a director of development in the Signal Corps and Air Force—all of whom are now leading figures in industry—and Mr. D. G. Little of Westinghouse; Col. H. H. Schenck of IT&T; Mr. E. W. Engstrom of RCA; Mr. W. R. F. Adams of General Cable; Col. J. L. Millar, Mr. F. H. d'Humy and Col. E. R. Slinte of Western Union; and Mr. L. S. King of the New Jersey Bell Telephone Co.

Kentucky

Among the guests at the chapter charter presentation ceremony in May were Col. C. A. Carlsten, Signal Officer at Fort Knox, and several members of his staff; and Col. T. H. Maddocks, Signal Officer of the Third Army at Atlanta, with members of his staff.

New York

Officers, Directors and Committee Chairmen of the New York Chapter met at Cavanaugh's Restaurant in New York on June 29th. They discussed ways and means of making the chapter larger and better able to assist in carrying out the missions of the Association. Special committees were appointed to study this matter. Among these were an Industry Committee, an Editorial Policy Committee and a Membership Campaign Committee. Col. William A. Harrington was chosen Secretary of the Chapter to succeed Lt. Col. Frank H. Fay who had resigned.

Richmond

At a business meeting on May 12th, the following new officers were elected: President—E. T. Maben; 1st Vice President—S. T. Terry, Jr.; 2nd Vice President—T. R. Gale. Miss Jean Melton was re-elected as Secretary-Treasurer. Membership, program and publicity committees were appointed. A monthly bulletin has been initiated by the publicity committee and will keep chapter members posted on chapter and Association activities and miscellaneous items of interest.

Rio

The Rio Chapter has been holding joint meetings with the Telecommunications Association of Brazil. At the May 27th meeting, Col. Herbert G. Messer spoke on "High Fidelity Reproduction of Phonograph Records" and demonstrated some new equipment. The June meeting was addressed by Col. Armando Dubois Ferreira, Chief Signal Officer of the Brazilian Army.

Sacramento

The last meeting of the season was held on June 16th at the Sacramento Signal Depot. The speaker was Mr. Francis Noel, State Director, Audio Visual Aids, who stressed the need for using every means for accomplishing speedier and yet more thorough training in the civilian school system.

Washington

A program designed to make the Washington chapter a robust model for the entire association has been outlined in an aggressive proposal by the chapter's president, Frederick G. Macarow, General Manager & Vice President of the Chesapeake & Potomac Telephone Company.

At a luncheon meeting of the chapter's officers and executive committee, Mr. Macarow presented for consideration definite steps to be taken toward stimulating chapter growth, and toward developing types of meetings which would attract present members. The chapter president pointed out that with the flow of industrial representatives through Washington, and with the proximity of the Services' communications headquarters, and other government communications agencies, the Washington AFCA chapter is in a naturally strategic position to be the leader in AFCA promotion.

One of the chapter's vice presidents, Mr. A. K. Mitchell, Washington Western Union Superintendent, enlivened the meeting with a vigorous attack on the over-emphasis of the military in the association. As an example of that trend, he said, the national meetings have been virtually Service shows with industry playing a very minor role.

A suggestion that AFCA meetings be combined with meetings of other communications groups, such as the I.R.E., came from a guest at the luncheon, Mr. Roland Davies, editor and publisher of Telecommunications Reports, and chairman of the AFCA's publicity committee. Mr. Davies held that by so combining meetings good turnouts would be practically assured for invited speakers, and at the same time the other groups would become better acquainted with the AFCA.

STUDENT CHAPTERS

Oklahoma A & M

The annual dinner meeting was held on May 7th. Officers were elected for the ensuing year as follows: President — George Thurmond; 1st Vice President and Reporter — William Preston; Treasurer—Capt. Milton M. Berry; Secretary—Charles E. Moser. An interesting lecture was presented on the Radio Relay System AN/TRC-1 by Capt. Joseph Oursler.

The first fall meeting of the Chapter will be held on September 24th.

State College of Washington

The charter petition for the State College of Washington Chapter was approved by the National Executive Secretary on May 27th. Chapter officers were elected as follows: President—Terrence S. Meade; 1st Vice President — Robert C. Nealey; 2nd Vice President — Jay W. Atherton; Secretary-Treasurer—Stuart W. McElhenny.

"HAMS" AND THE NAVY

From an address delivered by Rear Admiral Earl E. Stone, U. S. Navy, Chief of Naval Communications, to the Atlantic Division Convention of The American Radio Relay League at Washington, D. C.

As the Chief of Naval Communications I should like to mention a few highlights of the relations between the American Radio Relay League and the Navy, and our policy regarding those relations.

Our policy is that we will actively support the activities and program of the amateurs. We do so at international radio conventions and at home with the Congress, the Federal Communications Commission, and other Government departments and agencies. We shall continue to do so.

There have been times when some amateurs have not been happy with the results of certain governmental conferences. But at least partly because of strong military support many efforts to legislate amateur radio out of existence, or at least reduce the scope of amateur frequency bands, have been successfully resisted. No service or function, government or commercial, has anywhere near the frequency bands they want, and honestly feel they can demonstrate a positive need for.

A large percentage of our Naval Reservists, particularly in our electronics program, are also amateurs in good standing. We have urged our licensed amateurs to use the Naval Reserve communications equipment on amateur business in the amateur bands. They must, of course, be licensed amateurs. In that role they operate this equipment on the amateur frequencies, using amateur call signs and procedures. Some have been issued distinctive amateur calls containing a Naval Reserve identification and their ham-talk may very well be on Navy or Naval Reserve subjects. That is as far as we go in injecting Navy business into your picture. We do this to avoid any possible implication of military control or regimentation of amateur channels or activities. We also do this to maintain a clear delineation between the amateur as such and the Naval Reservist.

The Naval Reservist is an individual who is susceptible to mobilization upon the declaration of a national emergency and as such he is a man we can count on in our national mobilization plans. Incidentally, there are still plenty of vacancies in our electronics warfare units and we will especially welcome amateurs into those Naval Reserve units.

Our Naval Reserve networks, operating on Navy frequencies with Navy call signs, and Navy procedure, serve as the Navy training circuits for the individuals on whom we depend to fill our wartime billets if and when necessary.

It has been my pleasure on several occasions to commend various amateurs to the chairman of the Federal Communications Commission for their outstanding performance of duty during emergencies. In some cases these amateurs have been Naval Reservists and in other cases they were not. Their exploits have been invariably in accordance with the fine traditions that amateur radio operators of the world have developed through the years. No matter how mechanized and automatic normal communications may become we shall always need manual and voice operators (brass pounders and radio telephone technicians) when the going is toughest.

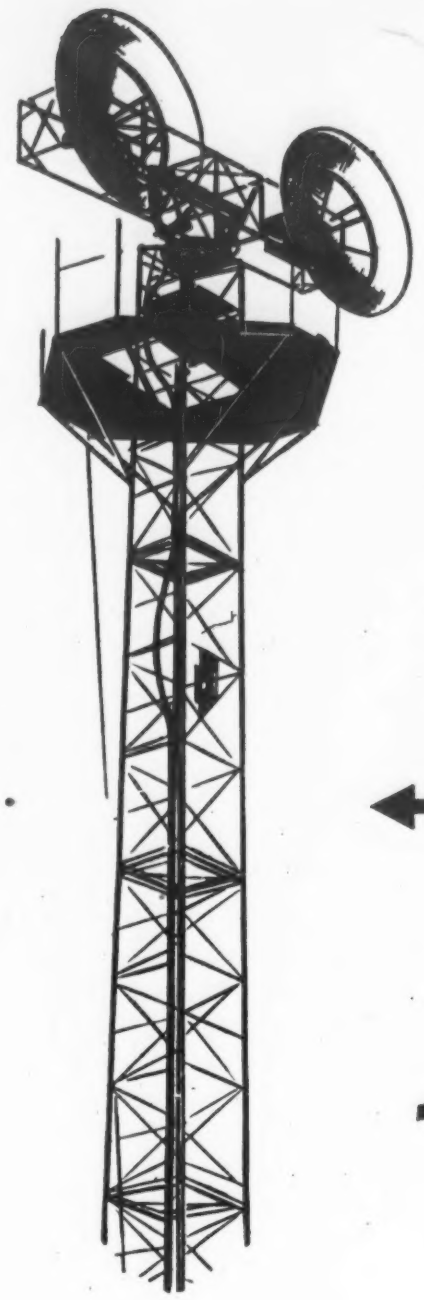
Many amateurs came into the Naval service during the recent war and I am happy to say that it is to them that we owe a great deal of the success which we attained during that conflict. Without their capabilities, both as operators and as experienced men in the general communications and electronics fields, we certainly could not so well have met the enormous responsibility which so quickly became ours. I am confident that there will be a similar response from the amateurs to help meet our future military and civil defense needs if the country ever again is faced with war.

The mission of the Naval Communication Service is to provide an adequate means of communication at all times, first to serve Naval command purposes, and secondly, for Naval administrative purpose. Our ships and airplanes and amphibious forces are well equipped for Naval communications. We have five principal and several smaller radio stations on shore in various places throughout the world, so that wherever our ships and airplanes and amphibious forces may operate they can be served as necessary by U. S. Naval Communications. At times we are called upon to serve other government agencies and departments. For example, we were recently called upon to set up a Navy communication unit at Jerusalem as a part of the State Department establishment there. That station was established in record time both for manual and radio teletype operation. We had to fly in the men and material early in May in order to be ready before the British pulled out on 14 May. The Chief of Naval Operations has commended that Naval Communication unit for carrying out its mission so expeditiously and well. Incidentally, one of the members of that small but important Navy unit is also an amateur.

It has long been Navy policy to encourage U. S. amateurs and U. S. commercial communication operating companies in peacetime, so that in time of emergency the nation will have amateur operators and commercial communication systems to serve the government and the military services. This is obviously a logical policy since the military services cannot maintain adequate trained personnel and adequate continental and overseas world-wide communication systems in peacetime due to lack of funds and personnel. Nor could a world-wide system be quickly established for the military services after war starts. But if there exist large numbers of U. S. amateur radio operators and efficient U. S. world-wide commercial systems to augment and support our integrated armed forces systems, then the military services can expect to operate effectively when war comes, in accordance with plans made in peacetime.

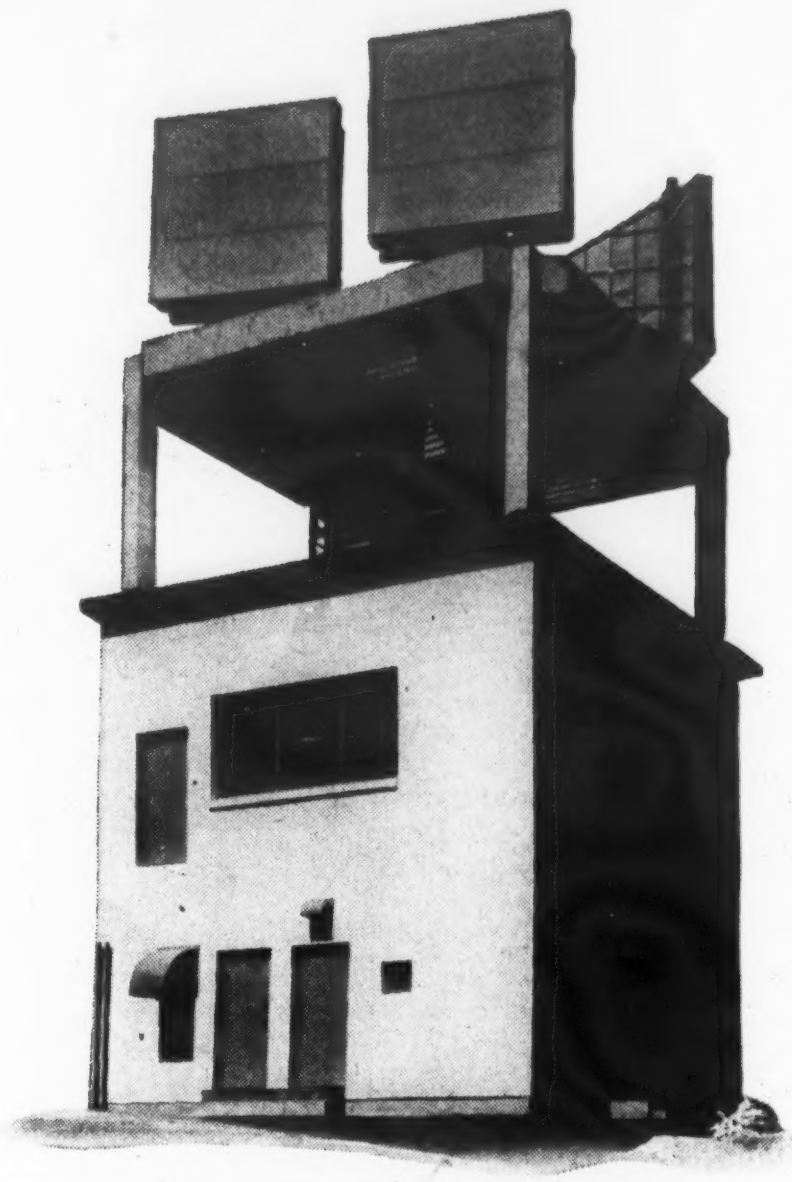
Like all other military officers I earnestly hope that there will not be another war. U. S. military personnel are as desirous as all good civilian citizens are to remain at peace. But if there should be war, men who know communications and electronics, as do the amateurs, will be invaluable in service to our country, especially in this age when our national security is daily becoming more and more dependent upon electronics and rapid communications. The amateurs have proven to me during two world wars that they are towers of strength in time of emergency.

Not only in wartime but in peacetime too, the Navy salutes the men of the American Radio Relay League. We know that amateurs have been responsible for many of the greatest strides which have been made in the last thirty years in development of electronics and communications. And we know that wherever communications are disrupted by storm or flood or earthquake the amateurs will respond immediately and provide emergency communication service—often assisting the Red Cross, the Coast Guard, and the military services. The members of the ARRL have an enviable record. I have a message of appreciation from the Navy, and it is a hearty—"Well Done!"



MICROWAVE PROGRESS

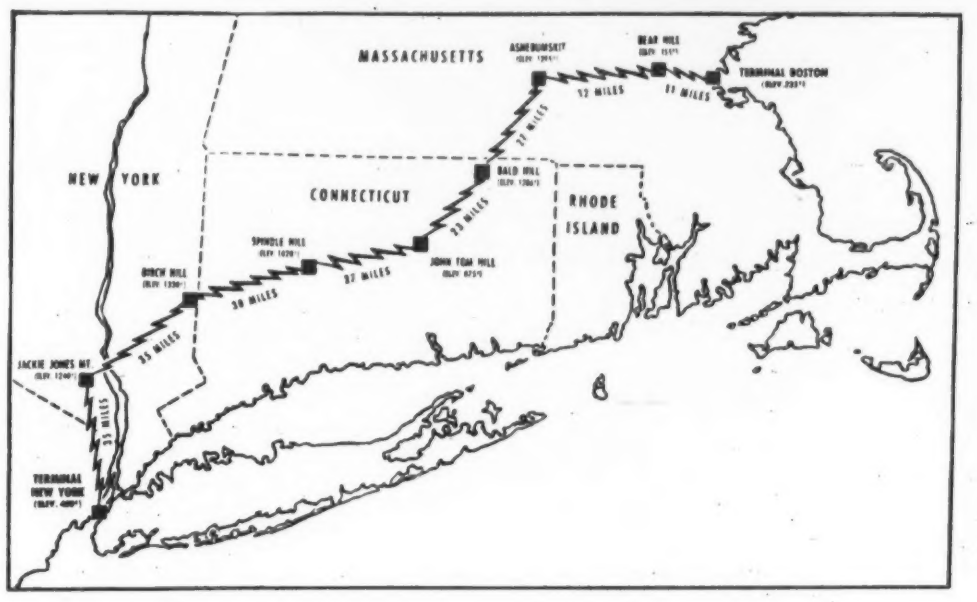
from the AN/TRC-6 ← to the New York-Boston relay link →



DURING the war the Western Electric AN/TRC-6 radio system won the praise of the Signal Corps from Germany to the South Pacific. These easily transportable units, providing eight two-way radiotelephone channels, followed close on the heels of our advancing troops to furnish dependable communications with the rear. Operating in the 5,000 megacycle range, their success marked a major step in the progress of microwave technique.

Out of the experience gained in the design and manufacture of this and other microwave systems has now come the latest stage in microwave development—the Bell System's New York-Boston relay link.

Repeater stations of the link are designed for utmost reliability in unattended operation. Every contingency is provided for to insure continuous operation regardless of storms or power failure.



The system is designed for a band width of about 4.5 megacycles, in order to handle television programs. This broad band width accommodates large numbers of telephone messages and other types of communications through multiplexing methods.

The use of radio relay by the Bell System will be greatly increased by the addition of similar systems now planned and under construction in other sections of the country.

– QUALITY COUNTS –

Western Electric

SIGNAL CORPS INDUSTRIAL MOBILIZATION PLANNING

By Col. Fred W. Kunesh

After the end of the war in Europe and before Japan surrendered, the Signal Corps realized the need for an industrial planning organization to function in peacetime. Accordingly, plans were made and immediately after V-J Day the Industrial Mobilization Branch was established in the Office of the Chief Signal Officer. After about a year of experimentation and reorganization the present organization has evolved. It consists of a small policy and supervisory group in Washington staffed by personnel selected from those branches of the wartime procurement organization which handled materials control, plant expansion and the expediting of production. An operating group is located in the Signal Corps Procurement District in Philadelphia. The office in Washington maintains liaison with other Services, the General Staff and Munitions Board, establishes Signal Corps policy, and supervises the group in Philadelphia which performs the detailed operations. That group keeps the records, makes the computations, works with industry and maintains liaison with the Signal Corps Engineering Laboratories at Fort Monmouth.

During the first year, a tentative planning manual was prepared which embodied the composite thinking of all personnel in the organization and the procedures to be established to accomplish the objectives of industrial mobilization planning.

Industrial summaries were prepared summarizing the production difficulties and experiences of the war in such fields as components, materials, financing and expansion of facilities. An analysis of production and procurement operations of the Signal Corps was prepared showing the manufacturer's production schedules and other information on some 600 to 700 principal items of Signal Corps equipment. Procedures for computing material requirements were established. A tentative list of planning items was developed. This was a list of more important items of Signal Corps equipment, items for which we believed detailed planning should be made. Information on manufacturing facilities as used during the war was consolidated and recorded.

Late in 1946 and early in 1947, the General Staff issued directives on specific jobs to be done. One job required the preparation of a list of major items considered essential to mobilization, the grouping of all other Signal Corps items into broad dollar value categories, and the computing of requirements for all items based on the Troop Mobilization Plan. The study was completed in November 1947.

The other job completed in 1947 under a General Staff directive was a computation of our requirements for steel, copper and aluminum in various shapes, sizes and forms to make the items needed for mobilization.

Our two basic responsibilities are:

1. To assist in the determination of requirements for end items, components and materials to support the military aspects of a national mobilization plan.

2. To make plans with that segment of industry over which we have planning cognizance to produce the required amounts of equipment in the shortest possible time.

As to the materials and components, we are assembling bills of materials and parts on every major piece of equipment and, during the past two years, we have obtained many such bills either by compiling them in our Philadelphia office or from manufacturers. The objective is to be able quickly to compute by machine methods the total requirements for raw materials, semi-processed materials, components and parts needed to produce all Signal Corps equipment. This information will be available for consolidation with the requirements of other Services and with those of the civilian economy so that the over-all needs of the country may be determined.

As the end item production capacity, we are working under the supervision of the Munitions Board and the General Staff on a facilities allocation program. The Munitions Board policy is to avoid having several Services working with the management of a particular plant in this planning. It has assigned to the Service or Bureau having a major interest in a plant the job of representing all the Services in planning that plant's war production. After a plant has been assigned to the Signal Corps, it is the policy of the Chief Signal Officer that a senior officer from his office personally make the initial visit to the management of the plant, explain the industrial mobilization plan and enlist their cooperation for further planning. If management is willing, then a complete survey is made of the facility to find out what it makes now, what it can make and what needs to be done in the way of plant or equipment expansion to reach the maximum production possible. Because of the complicated pattern of the electronics and communications industry and the interrelationship between its many segments, the Signal Corps is working closely with the Air Force and the Navy under the supervision of the Munitions Board, to produce a coordinated plan for the mobilization of the industry as a whole. Time consuming pre-production procedures, such as the processing of contracts and the scheduling of production, will be accomplished as far as possible in peacetime so that in an emergency each plant will know what it is expected to produce and can get into production quickly.

In addition to the liaison we maintain with industry in connection with facility surveys, we have funds in our budget for the purchase of what is called production engineering studies. In other words, if we feel that the production of a piece of equipment will present difficulties or if the time it will take to get into production on that item is too long, we contract with industry to make a complete study of the problem and come up with recommendations as to what can be done to cut down the lead time and minimize the difficulties.

As to industrial reserve equipment, at the end of the war much production machinery owned by the government was no longer needed. The Services made studies to determine what machinery could properly be put into storage to be issued to manufacturers in time of an emergency and thus save time and material it would take to fabricate such machinery again. Because of the rapid obsolescence of equipment in the electronics industry, the policy of the Signal Corps was established not to place a large variety of equipment in industrial reserve.

As for standby plants, the Signal Corps did not directly operate any plants during the war. After the war a study was made as to the advisability of retaining in standby condition any facility built under Signal Corps sponsored expansion program. It was decided that the Signal Corps would not recommend retention of any plants for two reasons:

1. Nearly all plant expansion would be purchased by industry in its own expansion program and

2. Changes in manufacturing methods are so great that a plant would have to be kept in almost constant operation to be of value in the future.

If a future budget allows us to continue with our present program and to keep our plans up to date, we will have, when an emergency arises:

1. Basic information on materials and components so that the allocation of scarce materials and components may be made in a logical, realistic, manner and

2. Give industry the go-ahead signal to produce war equipment they are familiar with and have planned for, with the least possible delay. Thus we hope to substitute preparedness measures for the time to mobilize that our allies have previously furnished us. We will not otherwise be able to buy time in a future war.

Millions of Americans—with RCA television—will see history as it is made at the two National Political Conventions.

Look before you vote—with Television

This year, television joins press and radio as a "political reporter," in Philadelphia, at the Republican Convention, June 21, and the Democratic Convention, July 12. As political leaders step up to speak, you're right with them on the convention platform.

The Candidate will be televised as he looks into the camera—talks to the people, face to face. His appearance, smile, gestures, combine with the sound of his voice, and his message, to complete the transmission of his personality. You have a new opportunity to know your man!

Important as any in history, the 1948 conventions will be covered from start to finish by keen-eyed RCA Image Orthicon television cameras. Highlights and sidelights, all will be seen. And what the camera catches will be sharp and clear on the screens of RCA Victor home television receivers . . .

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RCA **RADIO CORPORATION of AMERICA**

NEWS–SERVICES and INDUSTRY

General

80th Congress

This Congress made an outstanding record for peacetime in enacting legislation for the services. Chief among such legislation:

(1) Unification of the services by the National Security Act—admittedly a measure not too suitable, but a necessary first step.
(2) The selective service law — a compromise, but nevertheless quite satisfactory legislation.
(3) Establishment of forced attrition and promotion by selection for Army and Air Force officers as well as Navy and Marines.
(4) Retirement bill, granting to Army and Air Force officers much of the rewards enjoyed for some time by the Navy for wartime service in the form of retirement in highest grade, and providing a system of non-disability retirement for National Guard and reserve components of all Armed Services.
(5) Provided some increase in pay of Cadets and Midshipmen.
(6) Provided for inclusion in the Regular Services of WACs, WAVEs, WAFs.
(7) Appropriated nearly $14 billion for defense, including $200 million for communications equipment procurement and $32 million for research and development in that field.

Disappointing to those who consider it of highest importance to attract more of the best to military careers was the termination of the $1500 income tax exemption for officers and the total exemption on enlisted pay. This must be the only category of Americans which is being forced to take a reduction in pay during this time when on every hand we read of increases in pay to meet the spiralling cost of living.

Lack Heads RMA Industrial Mobilization Planning Group

Fred R. Lack, AFCA Director and Vice President of the Western Electric Co., has been named to head an eight-member Industrial Mobilization Policy Committee of the Radio Manufacturers Association which will have as its first objective persuasion of the government to establish a four-man committee to coordinate procurement of radio and electric equipment for the armed services.

Appointment of the committee by RMA President Max F. Balcom followed acceptance of the plan by the Association's Board of Directors after Mr. Lack had urged that such action be taken in an address before the annual membership luncheon of the RMA in Chicago in June.

Other members of the group are Paul V. Galvin, President of Motorola, Inc.; Frank M. Folsom, Executive Vice President of RCA Victor Division; Harry A. Ehle, Vice President of International Resistance Co.; George R. Haase, Vice President of Operadio Manufacturing Co.; H. L. Hoffman, President of the Hoffman Radio Corp.; W. A. MacDonald, President of Hazeltine Electronics Corp.; and R. C. Sprague, President of Sprague Electric Co. Mr. Galvin and Mr. Ehle are also AFCA directors.

Mr. Lack's suggestion for the government committee would involve the appointment of one high-ranking officer from each of the three military services—Army, Navy, and Air Force—and one civilian representing industry. The committee also will seek more long-range objectives to expedite the production of military equipment by spreading the work among all segments of the radio industry, both large and small, equally throughout major producing areas. The radio manufacturing industry is understood to be the first major industry to develop its own mobilization plan as a counter-proposal to several programs outlined by government agencies.

The Government Liaison Committee of RMA, which Mr. Lack headed, was dissolved by the Board at the Western Electric official's request preparatory to the appointment of the new industrial mobilization group.

The Communications and Electronics Equipment Committee of the Munitions Board is headed by Colonel Fred W. Kunesh, Chief of the Industrial Mobilization Branch in the Office of the Chief Signal Officer. The committee has been reorganized to include four members each from the three armed services and, besides Colonel Kunesh, consists of the following members: Department of the Army—Col. John F. Gamber, representing the Ordnance Service, J. S. Walker, representing the Director of Logistics, and C. H. Butler of the Office of the Chief Signal Officer; Air Force—Lt. Col. M. E. Willson, representing the Air Force Research and Development, and Maj. W. H. Mercer, Maj. R. J. Bowlin and T. G. Baptist, all representing the Deputy Chief of Staff for Air Forces Materiel; and Navy—Capt. C. A. Rumble, representing the Chief of Naval Operations, Capt. J. A. Edwards, Navy Ordnance, Comdr. E. G. Howard of the Bureau of Ships Electronics Division, and Comdr. C. L. Caldwell of the Bureau of Aeronautics.

Telecommunications Reports

Procurement Regulations

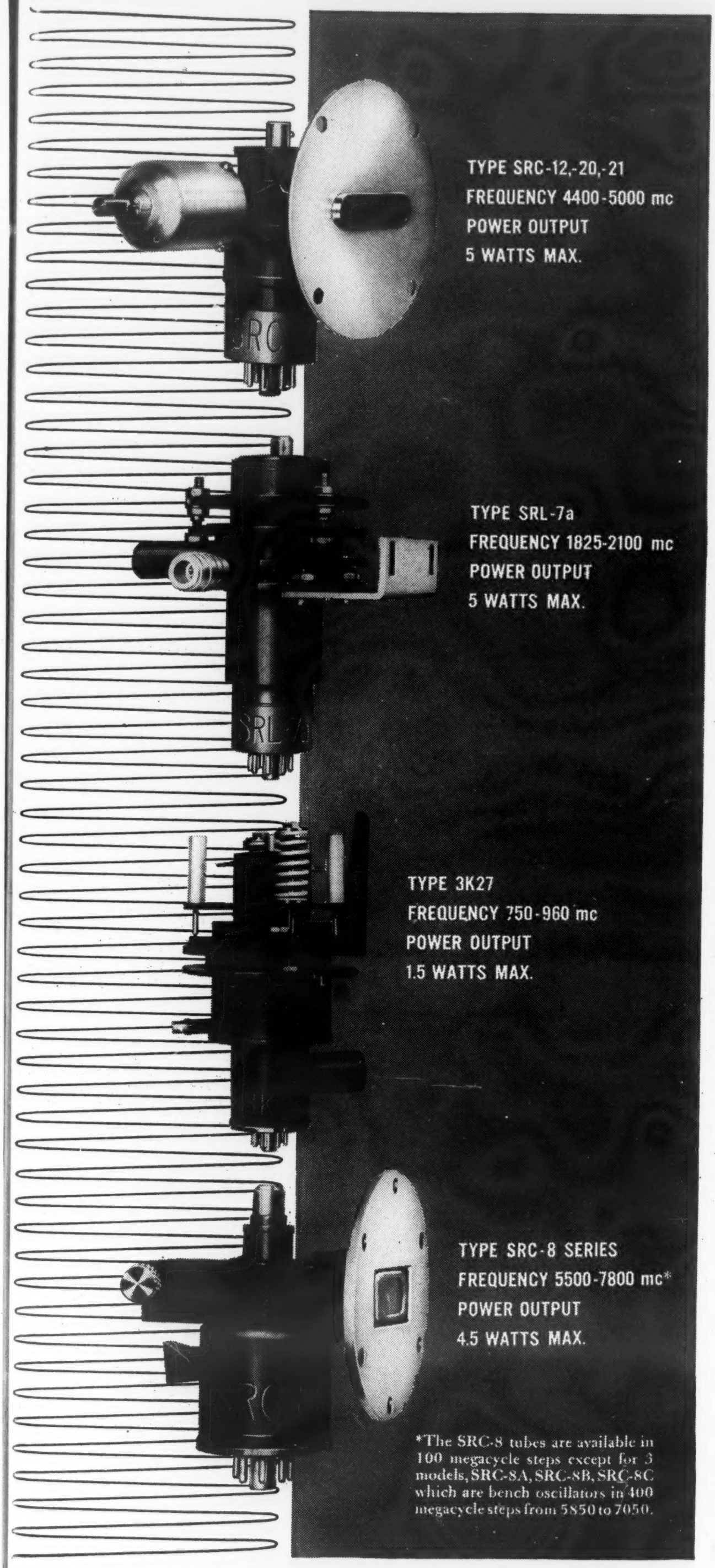
Mr. Thomas J. Hargrave, Chairman of the Munitions Board, announced recently the development of uniform procurement regulations for the armed services.

Prepared through the cooperative efforts of the Army, Navy and Air Force under Munitions Board supervision, the new regulations were issued jointly by the Secretaries of the three military departments, and became effective 19 May.

They supercede the separate regulations of the three departments, and provide common procurement methods and procedures for all contracting officers and purchasing agencies within the three services. Their adoption marks a major achievement in the effort of the military services, directed by Secretary of Defense James Forrestal, to provide greater efficiency and flexibility in the supply of combat elements of the armed forces, and to effect procurement economy wherever possible.

The new uniform procurement regulations issued by the Secretaries of the three services implement provisions of the Armed Services Procurement Act of 1947, Public Law 413, which was passed by the 80th Congress last year, and which also become effective on 19 May.

The regulations require all three services to use uniform contract clauses, forms, and termination procedures. Uniformity in the handling by the armed services contracting officers of patents, copyrights, and patent interchange agreements are provided for in the regulations along with uniformity in procurement advertising and negotiation.


TYPE SRC-12,-20,-21
FREQUENCY 4400-5000 mc
POWER OUTPUT
5 WATTS MAX.
TYPE SRL-7a
FREQUENCY 1825-2100 mc
POWER OUTPUT
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FREQUENCY 5500-7800 mc*
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*The SRC-8 tubes are available in 100 megacycle steps except for 3 models, SRC-8A, SRC-8B, SRC-8C which are bench oscillators in 400 megacycle steps from 5850 to 7050.

new klystron tubes

NOW AVAILABLE FOR MICROWAVE RELAYS

■ Four Sperry Reflex Klystron oscillators for microwave relay systems are now available for commercial use. These Klystrons can be used either as transmitting types or local oscillators. They can also be used in the laboratory as bench oscillators in the development of microwave relay systems.

■ With these new Klystron tubes, relay techniques are simplified and the mechanical problems associated with lower frequency relay links are overcome.

■ Other Sperry Klystrons are available in the frequency range from 500 to 12,000 megacycles. Our Industrial Department will gladly supply further information.

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Signal Corps

Officials Commend Monmouth in Visits

Royall Praises SC Labs

On completion of an inspection tour of the Signal Corps Engineering Laboratories and the Signal School at Fort Monmouth recently, Secretary of the Army Kenneth C. Royall made the following statement:

"On my tour of Fort Monmouth it was gratifying to see at first hand the important research and development work being performed by the Signal Corps Engineering Laboratories. This research and development, being performed as it is for the Navy and Air Force, as well as the Army, is carrying out the full spirit of unification.

"The laboratories are making notable progress in the miniaturization, integration, and standardization of communications equipment, an endeavor which is important to the producing industries as well as the armed forces.

"I was impressed by the clear and competent manner in which Signal Corps engineers presented these developments to me, and I was gratified to see the work of the Signal School in keeping military personnel abreast of advances in the maintenance and operation of modern communications equipment."

The Secretary, traveling by plane, was welcomed at the Lakehurst Naval Air Station by Brig. Gen. Francis H. Lanahan, Jr., Commanding General of Fort Monmouth. Others in the inspecting group were Col. Kirke B. Lawton, Deputy Chief Signal Officer; Col. E. R. Petzing, Engineering and Technical Division, Office of the Chief Signal Officer; Col. George S. Eyster of the Army Public Information Division; and Lt. Col. Ralph D. McKinney of the Logistics Division, General Staff.

Rep. Kerr Lauds Monmouth Work

Strong approval of Signal Corps activities at Fort Monmouth was voiced by Rep. John H. Kerr of North Carolina during the hearings by the Military Sub-Committee of the House Appropriations Committee on the Signal Service of the Army.

Addressing Major Gen. Spencer B. Akin, Chief Signal Officer, Mr. Kerr said: "General Akin, my trip to Monmouth was a revelation to me, and the information that we were able to get there and the display that you made of your wonderful work accomplished impressed me, as I knew it did the other members of the committee, most forcibly. I want to congratulate you on your achievement, and the other officers, and say that I think the nation owes you a debt of gratitude for the splendid service that you have rendered and the accomplishments you have attained."

Besides Mr. Kerr, four members of the Sub-Committee made the trip to Monmouth. They are Reps. Albert J. Engel of Michigan, Harve Tibbott of Pennsylvania, Errett P. Scrivner of Kansas and W. F. Norrell of Arkansis. The group inspected the Signal Corps Engineering Laboratories and the Signal School and were the luncheon guests of Brig. Gen. Francis H. Lanahan, Jr., Commanding General at Fort Monmouth.

Truman's Train-Plane Signals

President Truman's western tour in June brought a new wrinkle in communications—radio teletype contact between his train and his plane while both were moving.

When the President travels, he keeps in touch with the White House through United States Army Signal Corps radio. Radio teletype facilities have been installed on his train. Similar facilities are on his special plane, the Independence.

The Independence was acting as a messenger plane during Mr. Truman's tour, shuttling between the White House and wherever the Presidential train happens to be. While the train was between Montepelier and Pocatello, Idaho, and the Independence was flying over Ohio near Zanesville —the two were put in radio teletype communication with one another through the Army Signal Center at the Pentagon in Washington.

SC Photo School Moves

Transfer of the Signal Corps Photographic School from the Signal Corps Photographic Center at Long Island, New York to Fort Monmouth, New Jersey, has been directed by the Adjutant General. The move will be made by increments with the least possible interruption of the training. Courses at the school, which was established at its present location during the war, include camera repair, motion picture, still photography, and sound recording.

Maj. Gen. C. H. H. Vulliamy, Director of Signals, British War Office.

British Signals Chief in U. S.

Major General C. H. H. Vulliamy, Director of Signals of the British War Office, arrived in the United States on July 7 for a five-week inspection of American Army and commercial communications facilities. He came to the United States on the invitation of Major General Spencer B. Akin, Chief Signal Officer, who arranged the itinerary of the tour.

General Vulliamy was a member of General Dwight D. Eisenhower's staff at SHEAF during World War II. He called on General Eisenhower at Columbia University during his visit.

On arrival at New York City, General Vulliamy was met by Brigadier General Francis H. Lanahan, Jr., Commanding General at Fort Monmouth, N. J., and Colonel J. J. Duvivier, Chief Signal Officer, British Joint Services Mission (Army Staff). He traveled to Washington the day of his arrival, calling on General Omar N. Bradley, Chief of Staff, and other officers with whom he was associated during the European and African campaigns.

A tentative schedule arranged for the British officer included visits to Army installations in the vicinity of Washington, Baltimore, and Philadelphia and to Fort Bragg, N. C., Fort Monmouth, N. J., and to the United States Military Academy at West Point. He visited the headquarters of the major commercial communications organizations in New York City.

Although General Vulliamy now is Director of the British War Office, he began his military career as an engineer when he became a second lieutenant in 1913. However, when he went to France on the outbreak of World War I, he joined the 2nd Di-

Going places (AGAIN)

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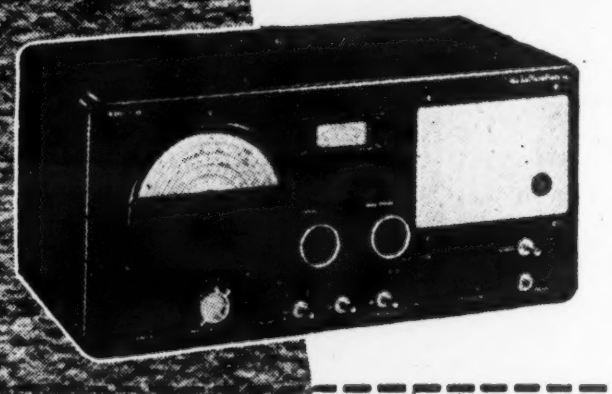
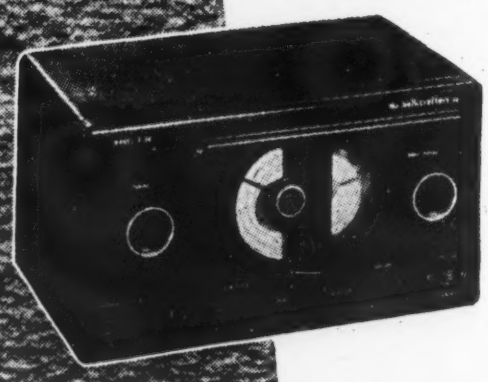
Hallicrafters famous radio equipment, sold and distributed around the world before the war and used with superb effectiveness in every theater during the war is once again on the move. Watch for latest details of the Gatti-Hallicrafters mobile radio equipped expedition to the Mountains of the Moon in deepest Africa—a new and exciting test for the ingenuity of hams and the performance of Hallicrafters equipment.

3

***Model* SX-42** Described by hams who have operated it as "the first real postwar receiver." One of the finest CW receivers yet developed. Greatest continuous frequency coverage of any communications receiver—from 540 kc to 110 Mc, in six bands. FM-AM-CW. 15 tubes. Matching speakers available. **$275.00**

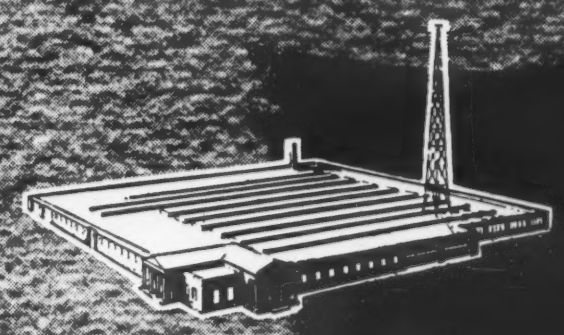


***Model* S-40A** Function, beauty, unusual radio performance and reasonable price are all combined in this fine receiver. Overall frequency range from 540 kc to 43 Mc, in four bands. Nine tubes. Built-in dynamic speaker. Many circuit refinements never before available in medium price class. **$89.50**



***Model* S-38** Overall frequency range from 540 kc to 32 Mc, in four bands. Self contained speaker. Compact and rugged, high performance at a low price. Makes an ideal standby receiver for hams. CW pitch control is adjustable from front panel. Automatic noise limiter..... **$47.50**

Prices slightly higher in zone 2



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visional Signals between the Marne and the Ainse. He spent most of the war in command of signal outfits in France and Belgium. At the end of the war he went to India.

In 1928 General Vulliamy graduated at the Staff College, Quetta. He held War Office appointments from 1931-35, after which he was promoted to lieutenant colonel and was posted once more to India. In 1938 he was made colonel, and in 1939 he became Chief Signal Officer of the Anti-Aircraft Command. In May of 1940 he became Chief Signal Officer of the North-Western Expeditionary Force, and later of the Eastern Command.

From May to October, 1943, General Vulliamy was Signal Officer-in-Chief, Middle East. He went from there to SHEAF.

After the war, the General again served in India until, in 1946, he was appointed Director of Signals in the War Office.

European Radio Meetings

Lt. Col. C. W. Janes, Chief of the Communication Liaison Branch, Office of the Chief Signal Officer, was the Department of the Army representative at the World Aeronautical Radio Conference at Geneva, Switzerland, and at the meeting of the International Radio Consultative Committee at Stockholm, Sweden.

Kodiak Now In ACS

An additional step in the expansion of the long lines facilities of the Alaska Communication System was taken recently when a new commercial long distance telephone service was opened between the island town of Kodiak and the United States over a 4,800-mile circuit.

The service was inaugurated by a three-way conference call between Kodiak, Chicago and Washington. Participating in the conversation was Mrs. Martha Cushing, owner of the telephone company in Kodiak; Governor E. H. Gruening of Alaska, from his office in the Interior Department, Washington; Hon. E. L. Bartlett, Alaska Delegate, from the House of Representatives Office Building; Col. T. J. Tully, Commanding Officer, Alaska Communication System, from the Pentagon, and J. H. Kellogg, President of the Kellogg Switchboard & Supply Company in Chicago.

Col. Guest to Pacific

Colonel Wesley T. Guest has been designated Signal Officer of the U. S. Army in the Pacific, to fill the vacancy created by the death of Colonel Joe J. Miller at Ft. Shafter, Oahu, June 1st.

Born in Mississippi, Col. Miller was a graduate of Mississippi A & M College. Entering the Army during the first World War he was commissioned as 2d Lieutenant in August 1917. He served in the European Theater in both world wars, receiving many decorations—among them the U. S. Distinguished Service Medal, the Croix de Guerre, Order of the British Empire, and Order of the Fatherland (Russia). In World War II he served as Signal Officer with the 2d Army, II Armored Corps, Third Corps, Fourth Army, Eighth Army, and the Ninth Army. He had been on his last assignment, at Ft. Shafter, since 6 March 1947.

Brig. Gen. Carroll H. Powell

Brig. Gen. Carroll H. Powell, USA-Ret., died from a heart attack at his home in Shrewsbury, N. J., June 20th. A veteran of three wars, the 55-year-old soldier had 31 years' service. He served during the Mexican Expedition and in both World Wars.

General Powell, who was retired in 1947, was on duty in Hawaii the day the Japanese pulled the surprise attack on Pearl Harbor. He was then assigned as Signal Officer for the Middle Pacific Theater.

During his long Army career he was awarded the Distinguished Service Medal, the Legion of Merit, and the Bronze Star Medal.

Army Ships to Get Loran

A contract award for 175 loran receiving equipments has been received from the Signal Corps by the Sperry Gyroscope Company. The receivers will be installed aboard ships of the Army Transport Service, now engaged in a modernization program.

Purchase of loran for Army transports is indicative of the increased peacetime use of this electronic system for determining a ship's geographical postion in any weather independently of celestial observations. The competitive award to Sperry includes a commitment for 175 sets of station spares, 18 sets of field depot spares and two sets of base depot spares.

Earlier this year it was announced that the Coast Guard had purchased 20 lorans from Sperry.

Gen. Lanahan Decorated at Ft. Monmouth Meeting

A group of more than a hundred outstanding figures in the communications industry and a number of military leaders were the guests of Fort Monmouth recently at a birthday celebration honoring the Signal Corps' Eighty-Fifth anniversary and accentuating the close and harmonious relationship between the Army and Industry.

Welcomed by Brig. Gen. Francis H. Lanahan, Jr., Commanding General at Fort Monmouth, and accompanied by Major Gen. Spencer B. Akin, Chief Signal Officer, the guests were briefed on post-war developments in military communications, photography, weather forecasting equipment, radar and other branches of electronics and went through the Signal Corps Engineering Laboratories. They were shown how equipment is tested under the worst possible weather conditions and were acquainted with the development of radar devices since the war, the use of infra-red light for the location of targets and the progress of the program for the miniaturization of equipment.

At a ceremonial review of troops Gen. Lanahan was presented with the Oak Leaf Cluster to the Legion of Merit by Gen. J. Lawton Collins, Deputy Chief of Staff.

The award was made in recognition of Gen. Lanahan's services as Chief Signal Officer, European Theater and European Command from July, 1945 through May, 1947. The citation, in part, reads: "As advisor to the Theater Commander on all occupational signal matters he established and operated a highly efficient United States Signal Communications System, including both occupied and liberated countries and further maintained the necessary guidance of and coordination with Signal activities of the Mediterranean Theater of Operations and United States Forces in Austria."

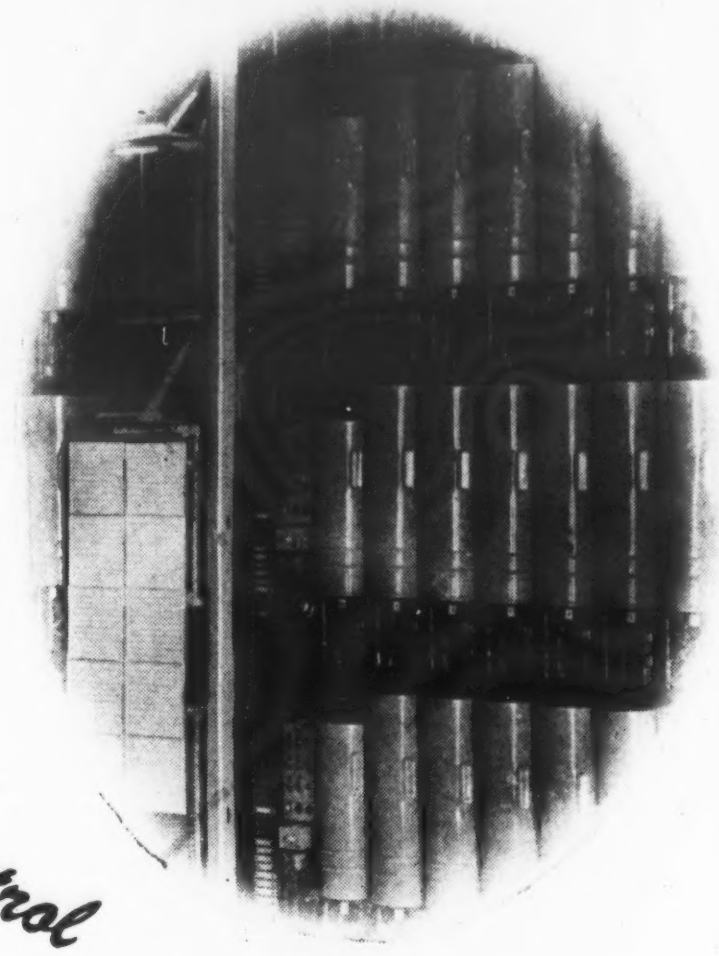
Automatic Weatherman

A portable "electric weatherman," which automatically and continuously records wind directions and wind velocities in remote, unmanned weather stations, has been developed by the General Electric Company for the U. S. Army Signal Corps.

The device is slightly larger than an infantryman's pack and requires attention only once a month. Time, wind speed, and wind direction are marked continuously on a moving roll

EQUIPMENT by AUTOMATIC ELECTRIC

for Communication and/or Control



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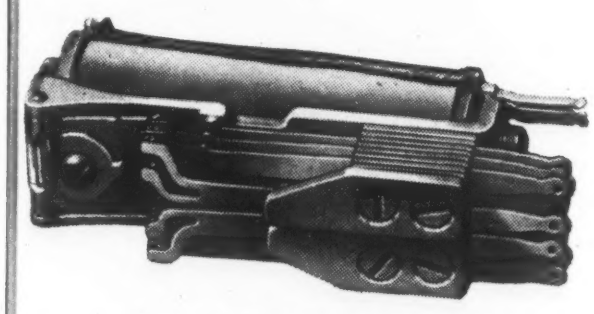
AUTOMATIC ELECTRIC HANDSETS

A wide variety of telephone handsets for wire or radio service (including the famous "Sound-Powered" handset that requires no power supply for telephone transmission). Used in ship's service systems, in public or private telephone systems, and in intercommunication systems for aircraft.



AUTOMATIC ELECTRIC RELAYS

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Modern, highly dependable equipment by Automatic Electric has stood the test of years of service in the Strowger Automatic Telephone System — one of the earliest and still one of the finest applications of electrical control and communication. This equipment is ready now to tackle a wide variety of assignments simply and effectively.

Shown here are just a few representative Automatic Electric products. In this broad line, you will find just the unit you need to solve almost any problem. Ask for further information on Automatic Electric components for communication and for control; or put your problem up to Automatic Electric engineers. Your inquiries will receive prompt attention.

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of paper, which is long enough to make an 800-hour record.

The "electric weatherman" uses no ink in making its records. Moving arms, connected electrically to a conventional anemometer (a wind velocity measuring instrument) and to a weather vane, mark specially-sensitized paper by sending sparks through it. The instrument can register wind velocities up to 150 miles-per-hour and can read direction correctly within one-and-one-half degrees. The paper moves beneath the markers at three-quarters of an inch per hour.

SC Lab Scientists Cited

Amory N. Waite, of the Coles Signal Laboratory, and Dr. George K. Green, formerly associated with the Evans Signal Laboratory, have received the Exceptional Civilian Service Award from the Department of the Army. Mr. Waite was cited for services in the Arctic and Dr. Green for work at Bikini.

British Honor SC Officers

Two Signal Corps officers—Brig. Gen. David M. Crawford (Ret.) and Col. Carter W. Clarke, Deputy Director, Intelligence Division, General Staff — were made Honorary Commanders of the Military Division of the Most Excellent Order of the British Empire at a recent ceremony in the British Embassy in Washington.

SC Photos for Sale

The Signal Corps is offering the public an opportunity to obtain pictures of the military events, units and personalities taken by its photographers during World War II.

In the files of the Army Pictorial Service in Washington there are more than 500,000 such pictures, any of which can be purchased at a price of 15 cents for a 4 x 5 inch or 50 cents for an 8 x 10 inch photograph on glossy paper. Requests, giving specific information as to the military designation of the unit, and the place and approximate date of picture should be addressed to The Chief Signal Officer, Attention: Still Picture Branch, Room 5A270, the Pentagon, Washington 25, D. C.

Mimeographed lists are available describing selected pictures of the various combat divisions. Pictures in file are usually identified as to divisions, regiments and separate units, but seldom by companies and battalions or smaller units. Special lists will not be compiled, but a limited number of descriptions of pictures on subjects requested, will be sent in reply to requests. Photographs may be seen in Room 5A 338, The Pentagon, Washington, D. C. Money should not be sent until interested persons have been advised that the pictures desired can be supplied.

Air Force

AACS HAM CLUB

A "ham" club composed of officers and enlisted men of the Airways and Air Communications Service opened officially for business the third week in June, Major General H. M. McClelland announced recently. Equipment includes 3 BC-610 transmitters, 2 SX-28 and 1 Super Pro receiver. Call sign for the station is W4ACS.

The station, which is located at Gravelly Point, Virginia, operates on 10-20-40 and 80 meters.

Major Joe H. Beler of the Airways and Air Communications Service credited General McClelland for arranging authorization for the equipment. "Because of his interest we were able to requisition almost everything we need for a first-class station," he said. The station not only will provide pastime for the men but also technical training. Major Beler himself is a "ham," having worked eighty-six countries—his last call being D4ABE in Bremen, Germany.

GCA School

Airways and Air Communications Service's CGA technical training program achieved another success when 20 officers and men were graduated from Gilfillan School at March Air Force Base.

Present plans call for training a total of 200 skilled technicians and maintenance mechanics this year. One class will be graduated each month from the school. Soon new classes will be inaugurated which will place major emphasis on knowledge of radio and radar.

At the graduation ceremonies, Gilfillan's Public Relations Counsel pointed out that since GCA equipment was first put into service the number of operators required to land a plane had been reduced from five to two. He added further that one-man units would be in operation in the near future. Experimental flight tests will be conducted within 30 days with completely automatic type GCA, he concluded.

AACS Men Like Their Work

Approximately three-fourths of enlisted Airways and Air Communications personnel expressed complete satisfaction with the kind of work they are doing, a recent poll disclosed.

This figure is all the more pleasing to Commanding General H. M. McClelland since many AACS men are completely isolated for months at a time in manning the Air Force's globe-girdling communications chain.

Many AACS men are recruited from the ranks of amateur radio operators—"hams"—and others interested in electronics, radio and radar.

The fact that AACS men are allowed to take advanced study in the fields of electronics, radar and radio probably accounts for the 78 per cent who stated that the Air Force was "a good place to learn a valuable trade or skill, or improve your technical training."

As of May 17, AACS operated 288 stations of which 118 were outside the continental U. S.

MATS Runs Athens Air Field

The Military Air Transport Service has assumed jurisdiction of the U. S. Air Force detachment at Hassani Airfield, Athens, Greece, which formerly was operated by U. S. Air Forces in Europe (USAFE).

The Hassani field is used for aerial support of the U. S. Advisory Group

AACS NEEDS MORE COMMUNICATORS

Radio "hams" and the 40,000 former members of Airways and Air Communications System are being urged to investigate reenlistment advantages, AACS Commanding General H. M. McClelland stated recently at Headquarters in Washington, D. C.

Critical categories of soldier-specialists in the electronics field are forcing AACS to continue indefinitely the hiring of civilian-specialist operators and teachers in order to man adequately its far-flung facilities. These specialists now number 177.

"Amateur radio operator high school graduates enlisting in AACS this summer could continue their hobbies—earn and learn at the same time," said General McClelland.

An AACS appeal was broadcast to the Southwest and Western states recently with excellent results.

in Greece and as a way-station and refueling stop on the connecting route to the Pacific in MATS' round-the-world operation. A shuttle route is also operated from Hassani to Ankara, Turkey.

Air Force personnel stationed at Hassani will advise Greek citizens in airport operation and the use of communications and weather equipment on the field.

Navy

Naval Lab's 25th Year

The 25th anniversary of the formal opening of the Naval Research Laboratory was observed in ceremonies at the laboratory July 2d.

The laboratory was commissioned in 1923, following recommendations made in 1916 by the Naval Consulting Board, chairmanned by Thomas Alva Edison. It is the largest naval activity devoted solely to scientific research and the application of scientific advancements to naval materials and techniques.

Plans for the Research Laboratory were initiated on July 7, 1915. The then Secretary of the Navy, Josephus Daniels, wrote to Thomas A. Edison on that date asking him to join a board to consider the problem of providing the Navy with machinery and facilities to make full use of American inventiveness.

Although the intervention of World War I delayed the actual beginning of the laboratory until 1920, its physical and administrative layout both followed closely the original recommendations of Edison's board.

When the laboratory was sufficiently completed to begin operations it was officially commissioned on July 2, 1923. At that time it had only four buildings in which about 100 employees worked on projects in only two scientific fields, radio and sound.

The present Naval Research Laboratory occupies about 50 buildings. More than 3000 employees are at work in an organization which includes three radio and one each of sound, optics, mechanics, metallurgy, chemistry, electricity and nucleonics divisions.

Among many now-famous scientific developments which were pioneered at the Naval Research Laboratory in its early years are radar and sonar. Experimentation on the uses of radio's short waves—at that time considered useless for communications purposes—was carried on at the laboratory, and it was Naval Research Laboratory-built equipment which sold the Navy on the possibilities of the higher radio frequencies.

An early clue to what is now radar was noticed by scientists of the laboratory in 1922. They were then making radio field measurements across the Potomac, and discovered that a ship passing through the radio field was detectable on the radio receiver.

It is a matter of record that by 1934 the radio technique which became radar was already far enough developed to be demonstrated to a group of Congressmen visiting the laboratory.

Another early Naval Research Laboratory project was the operation of aircraft by remote control. In 1923 an old Navy seaplane was flown entirely by radio remote control by laboratory scientists. It was the first pilotless aircraft flight made in this country.

During the war emphasis at the Naval Research Laboratory was shifted from research to the development of new weapons and equipment, and the improvement of those already in existence.

An example of the phase was the

You trusted them when the going was tough

—*they'll serve you just as faithfully today*

You and millions of other veterans learned during the war that you could rely on Ray-O-Vac LEAK PROOF Batteries. In all climates, on all continents, they stayed *fresh* in storage—came through famously under the hardest usage.

It's good to know they're still at your service—giving the same faithful performance whenever and wherever you need them.

For light, power, ignition—any dry battery need—there's a reliable Ray-O-Vac product. If you have any special battery problems, our laboratory can help you solve them. The Ray-O-Vac Company, Madison 10, Wis.

★ **Sealed in steel and protected by nine layers of insulation, to keep power in and trouble out.**

THIS GUARANTEE is printed on every battery: If your flashlight is damaged by corrosion, leakage, or swelling of this battery, send it to us with the batteries and we will give you FREE a new, comparable flashlight with batteries.

SPECIFY RAY-O-VAC LEAK PROOFS, AND BUY SPARES...THEY STAY FRESH

work done on sonar gear. Prewar study of the phenomena of sound in water had been confined almost exclusively to Naval Research Laboratory. Nearly all the underwater sound equipment used on Navy ships during the war had been developed in principle by the laboratory between wars. With the beginning of World War II work was begun to embody the known principles into useable equipment, and a continuing struggle was started to keep that equipment progressively more modern and efficient.

Research programs scheduled for the laboratory in the post-war period include an upper atmosphere study, study of guided missiles and pilotless aircraft, continuation of phases of the atomic energy research, and a multitude of other programs less well known to the public but of comparable scientific value.

Navy Assists Bernadotte

With the recent landing in Palestine of 51 Marine personnel, and the departure from the United States of three additional personnel for duty with the United Nations Truce mission, the United States Navy, including the Marine Corps, now has a total of 76 personnel assigned to duty in that area.

The Marines were landed from the USS *Marquette* to handle signal communication requirements for the military truce mission. The dispatch with which the Marines executed their mission in setting up and getting into operation the communication network prompted the United States officials in Palestine to compliment them and the captain and crew of the *Marquette* in a dispatch forwarded to the Department of the Navy.

Acting upon requests from the United Nations Organization, the Department of the Navy has been able to furnish promptly from the Sixth Task Fleet ships, jeeps, trucks, personnel, radios, DDT, and miscellaneous other material needed immediately by Count Bernadotte in carrying out his mission.

The first military group to arrive in Palestine was a Navy communications team consisting of one officer and eleven men. These personnel, assigned to the United States Consulate in Jerusalem, established communication facilities for the United States Consul General at the request of the Department of State. During heavy hostilities this group was the only source of communication with the United States. It once was interrupted by the heavy shelling of their headquarters. One member of the original group was killed, and one returned due to serious illness in his family.

The USS *Marquette*, an amphibious cargo ship, arrived at Haifa, Palestine on July 17, to deliver seven mobile radio sets, seven quarter-ton trucks and two one and a half-ton trucks. Marine personnel also were landed to operate this equipment.

Navy Guided Missile Study

Guided missile research being conducted by the Navy Department has recently delved into the possibilities of "automatic celestial navigation," according to a Navy expert.

Charles A. McPheeters, Director of Automatic Self-Navigation for the Navy Bureau of Aeronautics, stated that the Navy is conducting research to determine the use of stars in aiming guided missiles. "For the moment, at least," he said, "only automatic celestial navigation can provide the accuracy and reliability which is demanded in a long-range guided missile."

Automatic celestial navigation is based on a system of incorporating in guided missiles, machinery which, like human navigators on ships, will take constant bearings on stars, or other heavenly bodies. The ultimate purpose of such a system would be to avoid disruption of direction signals by the enemy.

Mr. McPheeters said that two methods under study have proved "to a certain degree successful." One method is the "automatic star seeker," where a missile mechanically seeks out a selected heavenly body and "tracks it" throughout the main part of its flight. The other method is by mechanical computations based on two or more stars, determining a missile's position in relation to the center of the earth.

Navy to Photomap Alaska

Six Navy P2V Neptunes are making a summer-long survey of 30,000 square miles of Alaskan territory in cooperation with the Department of the Interior and other Government agencies. It is the first comprehensive survey of the territory to be undertaken since 1929, when two Loening Amphibians mapped 13,000 square miles.

Data secured from the photographs, to be taken at 20,000 feet, will be used to determine the waterpower possibilities of the "panhandle" area from Skagway to the south, to estimate paper pulp resources of the area, and to meet the great demand for larger scale, more accurate maps than are available of the area.

The employment of improved aircraft and cameras and the large scale of the survey is expected to result in more accurate maps and better economic data for agencies cooperating in the survey.

For the aerophotographic work the P2V-2's carry cartographic, trimetrogen K-17 cameras with six inch lenses especially calibrated for aerial photography, and K-17's with 12 inch lenses for greater vertical detail. Oblique photography will be taken of the glacier areas.

The Navy previously made aerophotographic coverage of Alaska in 1926 and 1929 when an expedition covered Tongass National Forest and Glacier Bay. Until that time none of the interior of southeastern Alaska had been mapped from the air, and the maps in use showed only the coastline with inland areas mostly blank. The need for accurate maps of the area was considered necessary for the success of mining, fishing, lumbering, power and industrial development of the territory.

Government agencies cooperating in the project are the U. S. Geological Survey, U. S. Forest Service, Navy Hydrographic Office, the Alaska Road Commission, and the International Boundary Commission, United States, Alaska and Canada.

Civilian Components

Several months ago AFCA inquired concerning the policy about granting credits for inactive duty to Reserve and National Guard officers who are studying and working on problems for the Army as well as for attendance at certain association meetings which might be considered of value for military training. The following quotation from a recent letter from Headquarters, Air Defense Command, concerning this matter will be of interest:

"A firm policy on the award of such credits has not been announced by the United States Air Force although such an announcement is expected in the very near future. Pending the issue of such a policy it is suggested that individuals who attend meetings such as the annual AFCA exhibition at Wright Field and similar ones should take steps to insure that attendance is recorded on training credit forms at their respec

tive Air Force Base Unit (Reserve Training) headquarters. In this manner, credits may be awarded at such time as credits become authorized."

A decision on the granting of the inactive duty credits has been received from the Army and is set forth in circular 771, Department of the Army, which it is understood was published at a result of AFCA's suggestions. The pertinent provisions are quoted below:

Sec. III (b) Inactive duty status

(7) Credit for service relating to procurement planning and industrial mobilization will be as determined and certified to by the office of the Assistant Secretary of the Army or the chief of the supply arm or service under whose jurisdiction the work is performed, but not to exceed the actual time so spent, nor more than 8 hours in any one day.

(8) The Commanding General, Army Ground Forces, is authorized to allow credits for hours spent for other services performed by civilian component officers on the basis of 1 hour for each hour actually spent in performing the service, but not to exceed 8 hours in any one day; the same to be coordinated with pertinent Department of the Army staff agencies and chiefs of administrative and technical services to determine their policies when personnel of these agencies are involved. Hours credited for inactive duty will be granted only for activities that are supervised or previously approved by a unit instructor or other officer authorized by the Commanding General, Army Ground Forces."

NG and Signal Corps

The relationship existing between the National Guard and the Signal Corps is discussed by Major General Spencer B. Akin, Chief Signal Officer, in a recent issue of the *National Guardsman*.

General Akin says, in part:

"In line with the determination of the leaders and the rank and file of themselves into a powerful M-Day force is the Signal Corps' determination to supply them with the best in communications equipment.

"A recent survey shows that we have allocated and made available for issue to the National Guard approximately $53,000,000 worth of signal equipment without reimbursement. This includes 72 of our radar sets valued at $120,000 each. Other equipment made available falls in the following major categories: Radio, mine detectors, meteorological, wire communication, photographic and general signal equipment.

"The Signal Corps is deeply concerned with the National Guard training program because the considerable number of signal units in the troop basis of the National Guard form a key segment of our defense program.

"There are authorized a total of 27 National Guard division signal companies and 122 other signal units varying in size from construction battalions to small detachments. To maintain liaison and to assist in providing the necessary training the Sgnal Corps offers many contacts.

"In cooperation with the field forces we are conducting an indoctrination course for National Guard and reserve officers at the Signal School at Fort Monmouth, N. J. This course, which lasts two weeks, outlines the latest development and probable trends in the communications and related fields. In addition, quotas can be made available at the Signal School for National Guard officers to attend the regular 10 months' advanced officers' course or the associated advanced course of three months' duration. A three-month associate basic course for company-grade officers is also available.

"For school training of enlisted personnel the Signal Corps at Fort Monmouth offers a number of courses ranging from eight to 34 weeks. These courses include instruction in basic Signal Corps activities, such as cable splicer, central office technician, radio repairman, radar mechanic, teletype mechanic, and other related jobs. An enlisted school for photography is conducted at the Signal Corps Photographic Center at Astoria, Long Island. Qualified National Guardsmen are eligible for admission to this school.

"To meet the training-film requirements of the National Guard the Signal Corps has procured 3,000 motion-picture projectors for use in armories and other training sites. The availability of this equipment has resulted in a substantial amount of training being accomplished by the use of training films and film strips. In addition to the utilization of films for training, National Guard recruiting units have access to over 150 films that have been cleared for recruiting purposes."

Army Tours For Reservists

The Army has announced the opening of nine-month to one-year tours of duty within the United States for approximately 20,000 members of the Enlisted Reserve Corps. The reservists, who will be chosen from the best qualified volunteers, will be used as recruit instructors and experts in other military skills.

Men who are accepted for the tours will be called to duty in the grades and military occupational specialties which they hold in the Enlisted Reserve Corps and will be eligible for promotion. At any time during their tours, and within twenty days after returning to inactive status, they will be eligible for enlistment in the Regular Army in the same grade as that held in the Enlisted Reserve Corps.

Physical and mental standards in effect for members of the Regular Army will be applied for reservists seeking tours.

Though assignment to a given post throughout the tour cannot be guaranteed, the individual will be assured of spending his entire time in the Army area in which he volunteered for duty.

Retirement Bill Signed

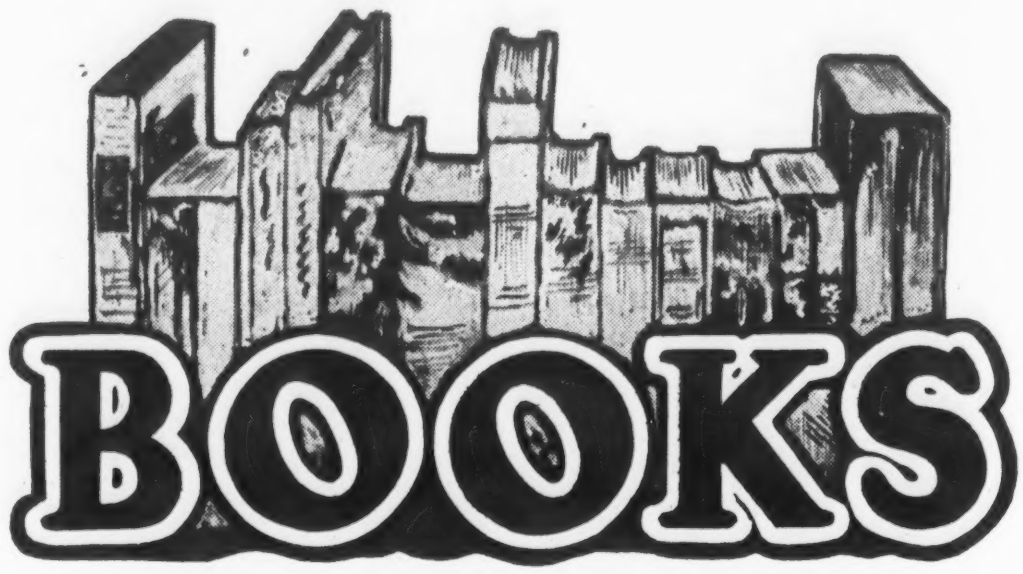
The bill providing retirement benefits for members of civilian military reserve components became law with President Truman's signature recently.

Reserve personnel of the Army, the Air Force, the Navy, the Marine Corps and Coast Guard are rewarded in the bill for long years of weekly drill and summer active duty training. Basically, the new law will provide retirement pay for those with twenty years of acceptable membership after they reach the age of 60.

As a reserve officer himself, President Truman issued a statement praising the bill as an incentive to the building of a stronger reserve system. He called on the regular services and the civilian components to work together "in full partnership in maintaining vigorous and effective national defense."

The appeal of the reserve retirement plan was so strong to Mr. Truman that he confined his statement to this part of the law, although it contains two other parts dealing with the elimination of sub-standard regular officers and with the retirement of regular personnel.

The benefits begin when a member, whether an officer or enlisted man, retires from a reserve component after twenty or more years of active membership. They are computed at 2½ per cent of base pay plus longevity multiplied by the number of years of active service.



AND SERVICES

THE PRICE OF POWER, by Hanson W. Baldwin. 361 pages. Harper & Brothers. $3.75.

ANY BOOK by Hanson Baldwin is worth reading. You may not always agree with what he says and with how he says it, but his writings are always stimulating and deal with important current problems with which every citizen should be familiar.

"The Price of Power" is such a book. Here are marshalled together the essential facts dealing with our national security. The author sketches the problems we face in our foreign relations, discusses at length the strength and weakness of our military position, and comments on the economic and psychological problems we are currently encountering. He argues for a "defense-by-offense" strategy, for an intensified merger of the armed forces in which air has first priority, the navy second, but with the army "by no means neglected." He champions the Central Intelligence Agency as the hope of the future, the Research and Development Board as the great coordinator of all scientific progress, the National Security Resources Board as the arbiter between so-called civilian and military needs, and a civilian defense board which will direct the effort of preventing hysteria in a nation unable to disperse its industries. He believes that UMT in its present form will weaken rather than strengthen us and that by voluntary enlistment with better advertising, we will have more efficient force in being than by any other method.

This summary does not do justice to the many detailed aspects of the security problem which Mr. Baldwin discusses with insight and understanding, nor to the debatable generalizations and conclusions which he introduces at inopportune moments. For some reason or other Mr. Baldwin has developed a phobia about the "military mind," which he has never concretely defined, but which he fears like the plague. In every aspect of national defense he sees the military subverting civilian control. The merger, the National Security Council, the Joint Chiefs of Staff, the military allocations to basic research, military officers in CIA, the Munitions Board, etc., all are suspect. Civilians can do no wrong, the military can do nothing right. Little in the record of the armed forces justifies such a superficial attitude. If it is to be total war, is it not about time that we stop thinking about military and civilian as if they were two opposed camps? This restraint is not only the duty of military men, as Mr. Baldwin points out, but also of civilians like Mr. Baldwin.

The book is full of essential data that the average citizen cannot obtain except by a most careful reading of hundreds of publications. Mr. Baldwin has rendered a great service by compiling into one volume most of the information necessary for the intelligent discussion of our national defense problem. This is a "must" book.

THE STILWELL PAPERS, by General Joseph Stilwell. 353 pages. Sloane. $4.00.

THIS IS "Vinegar Joe" Stilwell's own story of the war, taken from his private diaries, the "black notebook" in which he wrote his private opinions and judgments, and from his letters to Mrs. Stilwell.

The collection makes a blunt, outspoken summary of Stilwell's personal ideas about his allies, the enemy, the high command, Allied politicians, and everything else which fell under his eagle eye—and his biting tongue.

Stilwell's mission to China was political as well as military. He called himself a "deckhand diplomat" and found himself working with exactly the sort of stuffed shirts, and exactly the kind of high-level politics, civilian and military, which he detested most.

"The Stilwell Papers" is an autobiography of a great man, strong, unafraid, deeply devoted to his country—a man who believed that wars could be won only by fighting. The book is packed with shrewd, pithy judgments of the great men of World War II—and with the roughest, saltiest comment to come out of any war.

VERY HIGH FREQUENCY TECH NIQUES, compiled by staff of th Radio Research Laboratory, Ha vard University. Vol. I and I First Edition. 554 pages and 105 pages. McGraw-Hill. $14.00.

A SUMMARY of the methods, theorie and circuits used by the Radio Re search Laboratory, which will be o general interest to radio engineers an physicists. A compilation, drawn fro many other sources besides the RRL. does not pretend to be either a textboo or a comprehensive treatise coverin all aspects of the v-h-f field. Howeve as a reference work, it should save con siderable time and effort in the solu tion of problems in this field.

A representative cross-section fro the first volume would include ultra high-frequency measurements, the vari ous types of antennas, principles of di rection finding, homing systems, powe generation, and resnatron and magne tron operations.

The second volume includes such top ics as filters, receivers, detectors, mix ers, oscillators, and amplifiers.

THE RADIO AMATEUR'S HAND BOOK. By Headquarters Staff ARRL. 608 pages. American Radio Relay League. $2.00.

IT IS indeed difficult to review "The Handbook" for we feel that it is too well known to need an introduction. We cannot imagine anyone with an in terest in radio without at least one edi tion in his possession.

The latest edition of the handbook has 25 chapters—four more than last year. We cannot compare these editions by counting chapters. This year the editors have found several opportunities to combine theoretical and construction material. For example: the material that was in the chapters on radio-frequency power generation and transmitter construction in previous editions has been combined in a chapter on high-frequency transmitters. When theoretical and practical material is correlated in this way, the reader is often able to grasp difficult ideas that he is unable to understand from orthodox texts.

In addition to the usual transmitter and receiver circuits, there are five new chapters devoted exclusively to v.h.f., u.h.f. and microwave techniques and equipment. The vacuum-tube data tables have been brought up to date to include the latest tubes.

PREPARING FOR FEDERAL RADIO OPERATOR EXAMINATIONS, by Arnold Shostak. 404 pages. Prentice-Hall, Inc. $3.75.

THIS BOOK was written expressly for the student who is preparing to take the examinations for commercial radio operator's licenses.

The questions which appear in the book are taken from the FCC's pamphlet, "Study Guide and Reference Material for Commercial Radio Operator's Examinations." Selections of questions from this pamphlet make up each examination. Following each question is its answer given in the most simple and direct form, yet designed to give the student the background on the theory or practice involved.

AMERICAN FORCES IN ACTION—Omaha Beachhead (167 pages, $1.75)—St. Lo (128 pages, $1.25). By Historical Division, War Department. Superintendent of Documents.

OMAHA Beachhead and its companion monograph St. Lo are part of the series, "American Forces in Action" issued by the Historical Division of the War Department for the information of soldiers wounded in the actions described. These two booklets are outstanding in the "Action" series for their completeness of photographs and situation maps and the introduction of frequent estimates of the situation as viewed by the German Army Group.

On Omaha Beach V Corps touched down against stronger opposition than that encountered by Allied forces on the other Normandy beaches. The disasters that befell the landing craft, tanks and men of the leading waves cause the reader to marvel that the succeeding waves were able to expand the beachhead. Strong tides, choppy seas and enemy fire disrupted boat waves and scattered and paralyzed most of the units in the initial assault. That the assault finally succeeded was due to determined attacks by small groups, the lack of depth of German defenses and our superiority in the air.

The battle experiences described in these two volumes present realistic pictures of beachhead and hedgerow fighting. Every problem of combat is encountered in the course of the actions, including crippled communications, intermingled units, loss of equipment, erroneous information and shattered morale. No military man will fail to find these battle reports extremely interesting.

SUNSPOTS IN ACTION, by Harlan True Stetson. 252 pages. The Ronald Press Company. $3.50.

SOLAR RADIATIONS accompanying sunspots have become so important a factor in radio communication that this up-to-date summary of the effect of sunspots upon the earth and its atmosphere is highly welcome.

Many recent books cover the fields of electronics and radio communications, but for the most part such volumes as have appeared devote scarcely more than a chapter to the propagation of radio waves through the atmosphere, with a casual mention of such relations as have been found to exist between sunspots and the electrical ionization of the upper air. Mr. Stetson deals exhaustively with the subject in his book.

COLOR PHOTOGRAPHY FOR THE AMATEUR, by Keith Henney. 355 pages. Whittlesey House. $5.00.

GOOD COLOR PHOTOGRAPHY is now within the reach of every amateur. The author describes all the details of making color prints—the improvements made during the war in film and lenses and new developing formulas.

Mr. Henney tells how to make transparencies in color with Kodachrome, Ansco, and Ektachrome color materials; how to make prints on paper by the new Carbro methods, Wash-off relief, Dye Transfer, and Printon processes; how to make separation negatives from transparencies and direct from the subjects. Descriptions are given of new processes such as S-T Tripac separation negatives and Ektacolor film. The apparatus necessary for each process is described, giving brand names, and estimates are made of the costs.

TELEVISION: THE EYES OF TOMORROW, by W. C. Eddy. Prentice-Hall. 320 pages. $3.75.

A COMPLETE, authoritative, up-to-the-minute account of television from basic principles of operation to to stage a full-scale broadcast. Written and illustrated by an outstanding television pioneer, this book illuminates in an easily understandable, non-technical way the secrets of tomorrow's most exciting industry.

This is an essential guide for all who wish to get quickly and easily the fundamental facts of television. Authentic and comprehensive, it is invaluable for advertisers, writers, actors, technicians, and students, as well as anyone curious about the "Eyes of Tomorrow."

RADIO AMATEUR'S BEAM POINTER GUIDE BOOK, a Rider book for hams. 32 pages. $1.00.

THE radio amateur operator by merely consulting the charts of this new Rider book can accurately point his beam to any country or island in the world containing amateur prefix listings. The charts in the book are calculated so that the radio operator can point his beam from any place in the U. S. (as well as many foreign cities) to any place in the world.

The orientation of the antenna in degrees from magnetic north for every prefix is tabulated in this book; contains a country-prefix listing and a cross-index of prefix-country list. Explanation of great-circle maps; the difference between geographic (true north) and magnetic north; use of the tables, etc.

AMERICAN FORCES IN ACTION SERIES PASSES 150,000 SALES MARK

SALES of the Army's World War II historical series, "American Forces in Action," to date total nearly 152,000 copies.

Increased production costs since original publication have necessitated slight price increases for most of the volumes. "Anzio," issued two months ago, sells for $1.50. "Small Unit Actions" sells for $1.50; "Salerno" is 60c; "Papuan Campaign," 55c; "Makin" and "To Bizerte with the II Corps," 45c. "Merrill's Marauders" and "The Admiralties" are both 40c; "Guam," "The Volturno," and "Fifth Army at the Winter Line" are 35c.

All of the volumes are liberally illustrated and contain reference maps of the actions described. Publication of the fourteenth and final title of the series, "Utah Beach to Cherbourg" is expected during the early summer.

Orders for the books should be sent directly to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

AIR VICTORY, The Men and the Machines, by Harold B. Hinton. 428 pages. Harper & Brothers. $5.00.

THE STORY of the growth of American air power from its first beginnings through its impressive coming of age in World War II.

This is in no sense an "official" chronicle, but it has had the sympathetic interest and help of most of the air pioneers who built the Air Force. Official files and records have been carefully searched for the facts underlying the story.

FREQUENCY ANALYSIS, MODULATION AND NOISE, by Goldman Stanford, 448 pages. McGraw-Hill. $6.00.

A COMPREHENSIVE discussion of the important subjects of Fourier integral analysis, modulation and random noise.

ELECTRONIC ENGINEERING PRINCIPLES, by John D. Ryder. Prentice-Hall. $6.65.

THE AUTHOR gives clear coverage of the subject of electron ballistics which he believes fundamental to the understanding of all electron tubes, He treats with the direct applications of ballistic principles, such as cathode ray tubes and magnetrons. The fundamental principles of thermal emission and space charge are thoroughly discussed with emphasis on physical principles. Also included are descriptions of basic gaseous conduction followed by power rectifier circuits, gas control tubes and

control circuits. The final chapters deal with photoelectric emission and photoelectric cells.

FUNDAMENTALS OF RADIO, by W. L. Everitt. Prentice-Hall. 400 pages. $5.00.

FUNDAMENTALS of Radio is the most complete and authoritative book in the field of basic radio. Each of the authors is a recognized authority and has had extensive experience in the radio field.

This book presents the basic material of radio required for all types of radio work. The entire field of basic communications is covered, from the simplest A.C. to D.C. circuits, through vacuum tube theory and applications, wire telephony and audio systems, including F.M. transmission.

EXPERIMENTAL ELECTRONICS, by R. H. Muller, R. L. Garman and M. E. Drox. 330 pages. Prentice-Hall. $5.00.

BECAUSE electronics plays such a vital part in modern instrumentation and automatic process controls, this book is of particular interest and value. The radio engineer or communication expert may glean from its experiments a point of view or statement of problems rarely encountered in his own specialty.

ELECTRICAL ENGINEERING, by Fred H. Pumphrey. Prentice-Hall. $5.35.

THE essential theory and physical concepts of electrical engineering, that are employed in other branches of engineering, authoritatively presented in concise and readable form.

The contents includes chapters on the following subjects: D. C. Circuits, Electromagnetism, D. C. Generators and Motors, A. C. Circuits, A. C. Generators and Motors, Electron Tubes and Circuits, Heating, Welding, and Electro-Chemical Processes, Electric Motor Methods of Industrial Illumination, Electrical Methods of Industrial Instrumentation, Electrical Control in Industry, Industrial Wiring Systems, Electric Power—Economics and Maintenance, Electrical Communication.

MICROWAVE TRANSMISSION DESIGN DATA, by Theodore Moreno. 257 pages. McGraw-Hill. $4.00.

TRANSMISSION-LINE theory and the topics of coaxial lines and flexible cables as applicable to ultrahigh frequencies. With chapters on the structures and components of wave guides, dielectric materials and their properties and cavity resonators.

ELEMENTS OF RADIO, by A. Marcus, W. Marcus and R. E. Horton. 699 pages. $4.00. Prentice-Hall.

A BASIC and elementary home-study course on the fundamentals of radio which requires no advance knowledge of physics and mathematics. There is now an acute and growing shortage of skilled radio technicians and operators. An understanding of the contents of *Elements of Radio* will lead to operational skills that are basic for such jobs in industry as: Radio mechanic and technician, radio operator, signal communication instructor, ground radio repair instructor, and other equally interesting and responsible posts.

INDUSTRIAL ELECTRONIC MAINTENANCE, by R. C. Roetger. Prentice-Hall. $3.50.

A COMPLETE sourcebook of practical information on electronics in the industrial field. The opening chapters deal with maintenance and service and describe the scope of such work and the manner in which various problems are handled. Tools and instruments are covered in the next chapters which include descriptions of special meters and test apparatus. The maintenance of meters, relays and electro-mechanical devices related to electronic apparatus is also thoroughly discussed.

PHYSICS; A BASIC SCIENCE, by Elmer E. Burns, 686 pages. $2.88.

THIS 2nd edition is revised with some new material and additional problems. The major changes are additional sections on radar and atomic energy and an explanation of the jet engine.

STAR-SPANGLED RADIO, by Edward M. Kirby & Jack W. Harris, foreword by David Sarnoff. 286 pages. Ziff-Davis. $3.50.

THE role played by American radio in World War II.

AIR FORCE HISTORY. $5.00.

VOLUME I of the history of the Army Air Forces in World War II has been printed at the University of Chicago Press. The volume describes the development of the Army air arm from 1918 to 1941, and relates the story of air operations from Pearl Harbor to mid-summer 1942. Volume II of the seven-volume history is in the process of being edited, and is expected to appear this fall. It will cover the organization and activities of the USAAF in ETO, MTO, and the Middle East from the summer of 1942 through December 1943. The five remaining volumes of the series are scheduled to be published at intervals of approximately six months.

Volume I will sell for $5.00. It contains approximately 700 pages, with 70 maps, charts and photographs.

AACS HAM DIRECTORY

PUBLICATION of the second issue of the *AACS Amateur Radio Station Directory* was announced recently by Headquarters Airways and Air Communications Service. This directory supersedes the initial issue dated May 15, 1947 and all subsequent revisions.

The publication lists alphabetically AACS and ex-AACS amateur operators by name and stations, and is cross-indexed by a simple call sign. Copies have been distributed to former AACS members who are identified further by an asterisk preceding the alphabetical listing. Requests for the directory are to be addressed to: Commanding General, Airways and Air Communications Service, Washington 25, D. C. ATTN: A-3, Directorate of Operations.

INSIGNIA OF THE ASSOCIATION

ORDERS are now being received for November delivery for the Association Insignia in full colors suitable for framing as mentioned in May SIGNALS. The cost of the emblem, 5¾" in diameter on 8 x 10 white background, will be $1.50. Order now to help us determine the number of copies we need to purchase.

MEMBERSHIP CERTIFICATE

PRINTED on fine diploma paper with the Association emblem in full color and the member's name engrossed by hand suitable for framing. $1.50.

LAPEL BUTTON FOR CIVILIAN WEAR

THE Association emblem ½" in diameter, in color, for wear in the lapel of your civilian clothes may be had at the following prices. Please place your order now for delivery in November. This will help us to determine the number of buttons we need to stock.

Bronze .90 Sterling .90
10 carat gold $4.00.

Our Book Department can furnish, in limited quantity, any book currently in print. We will also help you secure older titles that you may need to complete your library. A 10% discount is allowed all Association members on orders of $2.50 or more except for technical books. Please indicate author and published where known, and allow at last three weeks for procurement and delivery.

Can we safeguard the World for our children?

The more a peace-loving nation can disseminate its ideas, the more other nations will oppose war. The I T & T, *America's largest system of world-wide communications,* believes that international communications, through telegraph and telephone networks, will play an important part in maintaining peace...When men can *talk* together, they can *get* together.

"We must not again permit any aggressor people to doubt that all the power of the United States will be available and ready to stop aggression."

I T & T ANNUAL REPORT, 1946

INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION
67 Broad Street, New York 4, N. Y.
U.S. Manufacturing Subsidiary—Federal Telephone and Radio Corporation

I T & T COMMUNICATIONS

I T & T is the largest American system of international communications. It includes telephone networks in many countries, 47,000 miles of submarine cable, 6,600 miles of land-line connections, over 60 international radio-telegraph circuits and more than 50 international radiotelephone circuits.

I T & T RESEARCH AND MANUFACTURING

Associates of I T & T maintain electronic research laboratories in the United States, England and France, and operate 35 manufacturing plants in 25 countries which are contributing immeasurably to the rehabilitation and expansion of communications in a war-torn world.

WORLD UNDERSTANDING THROUGH WORLD COMMUNICATIONS

Letters TO THE EDITOR..

Sir:

"Thank you for your letter of 9 June 1948, concerning my election as President of the Washington Chapter of the Armed Forces Communications Association.

"I am entirely in agreement that the association is in a position to contribute materially to the country's military preparedness program and I am confident that our chapter will take its place among the leaders in that effort.

"In the event that the 1949 annual meeting of the association is held in this area, the Washington Chapter will, of course, be proud to serve as host."

F. G. MACAROW
Vice President and
General Manager
Chesapeake & Potomac
Telephone Co.

Sir:

"I deeply appreciate the copy of the resolution adopted by the Armed Forces Communications Association at its recent annual meeting, which you forwarded to me in your letter of 18 May 1948.

"We in the Army are gratified to know that we have the continuing interest of the association and its members, and shall at every opportunity avail ourselves of the invitation to request assistance in the solution of any problems which the organization may be able to help us solve.

"The assistance of the Armed Forces Communications Association in helping maintain closer understanding and cooperation between the Army and scientists, engineers, manufacturers, and operating companies in industry can be invaluable in the strengthening of our national security."

KENNETH C. ROYALL
Secretary of the Army

Sir:

"Your letter of June 18 indicating that Cadet William C. Burns won the first annual award to a cadet at the United States Military Academy for excellence in the course in electricity and electronics of the Armed Forces Communications Association make me proud and happy. I wish it had been possible to be on hand for the convention in Ohio when the award was made."

EVERETT M. DIRKSEN
House of Representatives

Sir:

"Mr. Arthur M. Hill has requested that I acknowledge your letter of May 18 transmitting a copy of a resolution passed by the Board of Directors of the Armed Forces Communications Association at its annual meeting in Dayton, Ohio on May 11. It is noted that the group and individual members of Armed Forces Communications Association place themselves at the disposal of all those Government agencies concerned with matters under the National Security Act of 1947, and that the association invites requests for assistance in the solution of any problems which its membership may be able to solve.

"It is indeed gratifying to receive such a pledge of assistance from this body of patriotic citizens. . . .

"As the organization of the Communications Division of this Board progresses, it is expected that your association and members of it will be called upon for assistance."

LEIGHTON H. PEEBLES
Consultant
National Security Resources Board

Sir:

"I would like to hear from my former colleagues in the Signal Corps at Fort Monmouth, N. J., the Holabird Signal Depot, Baltimore, and the Chicago Signal Depot (now located at Decatur, Illinois).

"It might be interesting to some of the old associates that the undersigned is Secretary-Treasurer, Department of Wisconsin, Reserve Officers Association of the United States."

DONALD L. COWAN, SR.
1st Lt., Sig. Res.
P.O. Box 330
Madison 1, Wis.

Sir:

"I am a member of the Communications Association and through my normal course of work, I have found a number of men who I am sure would be interested in our work. I firmly believe this society is vitally necessary to the national defense by providing a pool of trained men and women interested in communications. I would like it to increase its scope of operation, to seek out all the men and women who worked in the vast field of communications during the last war, and weld them together into a strong, informed society dealing in the current trends and future aspirations of the communications world.

"Therefore, since I am not too positive of the benefits, privileges and obligations of the society myself, I would like you to send me some literature of a nature which would cover those subjects mentioned, that through them I might interest others of the communications field in your organization."

GURNEY M. KRANZ

See that space above? It was reserved for the AFCA member who had something to say to us. But he didn't write.

That member might have had something complimentary to say—he more likely had a complaint to make. In either case his letter would have been highly welcome, because it's only through his comment that we will learn what he likes and doesn't like in the way of a publication.

He might have had a vigorous complaint to register about not receiving his copies of SIGNALS. In which case he certainly should have written.

And that reminds us of something we'd like to point out to all members.

There are a number of things that can happen to keep a member from receiving his SIGNALS issues. Sometimes we just plain foul up. Addressing the magazine envelopes is partly a purely mechanical process, and there's a good deal that can go wrong in *that* process. More often though, the member forgets to give us his new address when a change occurs. You'd be surprised how often that happens.

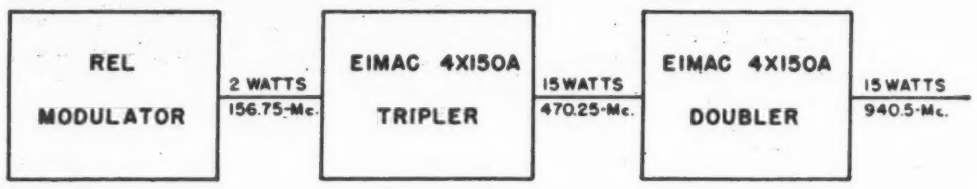
Wherever the fault lies we'll get it straightened out, and get those copies going, and to the right place, if you'll only *yell* when the copies that are due you stop coming. If you know a member who isn't getting his copies suggest to him that he do some yelling too.

In any event we'd like to hear from you. Surely you can think of something to brag or complain about.

15 WATTS AT 940.5-Mc. with the EIMAC 4X150A TETRODES

FREQUENCY UP 6X, (156.75-Mc. to 940.5-Mc.)
POWER UP 7X (2 watts to 15 watts)

Here's a STL transmitter that's in operation on the new 950-Mc. band, fulfilling all the FCC requirements and powered by Eimac 4X150A tetrodes. It's a part of the studio-transmitter-link between the San Bruno studios and the 250 Kw FM transmitter of station KSBR high atop 3849-foot Mt. Diablo some 33 miles away.



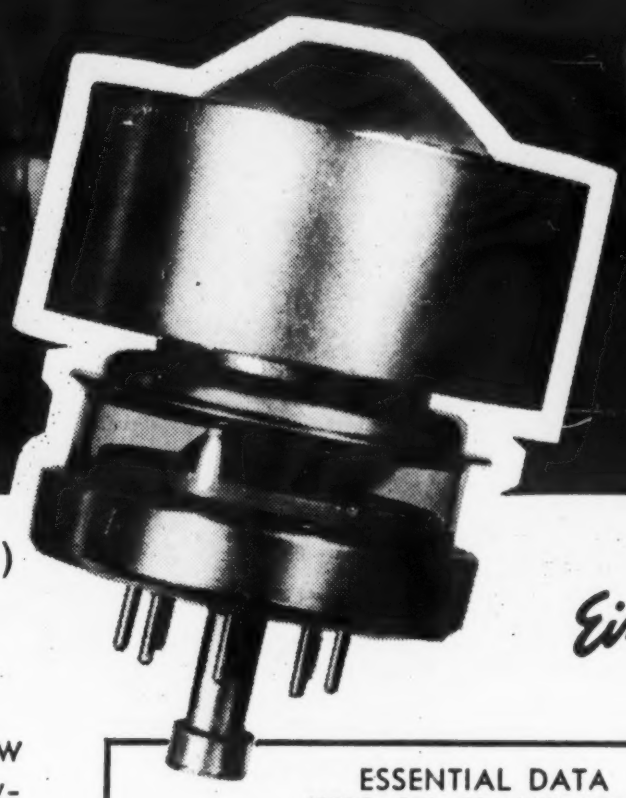
The R-F amplifier was specifically designed for the KSBR application by Eimac engineers. It is driven by an REL modulator delivering 2 watts output at 156.7-Mc. to one Eimac 4X150A in a tripler stage, which in turn drives a single 4X150A in a doubler stage, providing 15 watts useful output at 940.5-Mc.

The Eimac 4X150A is ideally suited for this application because of its high power gain at relatively low plate voltages, ability as a frequency multiplier without loss of amplification, low grid drive requirements, and a high ratio of transconductance to capacitance. It also has the advantage of being physically small and functionally designed for simple installation.

Complete data on the Eimac 4X150A for STL and other UHF applications is available by writing direct.

EITEL-McCULLOUGH, INC.
197 San Mateo Avenue, San Bruno, California

EXPORT AGENTS: Frazar & Hansen—301 Clay St.—San Francisco, Calif.



Eimac 4X150A

ESSENTIAL DATA
KSBR STL TRANSMITTER

REL MODULATOR, MODEL 694
EIMAC 4X150A, R-F AMPLIFIER

Useful Output Power	15 watts
Frequency	940.5 Mc.
Frequency Stability	.002%
Audio Frequency Response. Substantially flat	50 to 15,000 cycles
Distortion	.5% Max.
Noise Level	70 db below 100% modulation
	± 100 Kc. deviation

Eimac 4X150A
General Characteristics

Heater voltage	6.0 volts
Heater current	2.8 amps.
Minimum heating time	30 secs.
Grid Screen amplification factor	4.5
Direct interelectrode capacitance (Average)	
Grid-Plate	0.02 μμf
Input	14.1 μμf
Output	4.7 μμf

Maximum Ratings

D-C Plate voltage	1000 volts
D-C Plate current	250 ma.
Plate dissipation	150 watts
D-C Screen voltage	300 volts

Follow the Leaders to
Eimac TUBES
The Power for R-F

Copperweld Line Wire and Grip-Flex[38] Insulator Ties can make your outside plant just as permanent and safe as your inside plant. It's a fact!

The Copperweld Wire used in these products is permanently protected against corrosion. It is made by molten-welding a thick outer covering of copper to a core of strong alloy steel. Copperweld has the best conductance of any high-strength conductor. It also has better voice and high frequency transmission characteristics. It is stronger than copper wire or any other wire of comparable electrical properties. It is pliable—easy to handle—and because it lasts so much longer and requires so little maintenance it is unsurpassed for economy.

When you build your lines with Copperweld—you give them the strength of steel and the long life of copper. That's even better than putting a roof over your outside plant—and it's practical and economical.

Write for Engineering Data

COPPERWELD STEEL COMPANY, Glassport, Pa.

SALES OFFICES IN PRINCIPAL CITIES

GRIP-FLEX[38]
The Ideal Insulator Tie for use with Copperweld Line Wire

Copperweld TRADE MARK LINE WIRE

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